The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXVIII. June 18, 1938 No. 990

Technology of Scottish Oil Shale

THE economic position of the Scottish oil shale industry, as was pointed out in these columns last week, has necessitated a crescendo of technical improvement to enable it to continue in being in the face of the constantly increasing competition from petroleum products. The papers presented at the Conference on Oil Shale and Cannel Coal, which were summarised in THE CHEMICAL AGE, will enable the reader to obtain a picture of the technical condition of the industry to-day. It is natural that every effort should be made to reduce retorting costs, since it is here that the primary difference lies between petroleum and oil shale. Petroleum has negligible production costs, but must be transported over thousands of miles before it reaches this country; oil shale must be mined and retorted, but does not have to bear high costs of transportation. If the cost of retorting the shale could be made equal to the cost of transportation of petroleum, the industry would go a long way towards economic solvency, since the cost of refining the oil is probably similar in both industries.

There has been no change in the form of the retorts used in the Scottish oil shale industry for many years. Continuous vertical retorts are employed, all of which are characterised by a metal portion at the top in which the oil shale is distilled at a temperature not exceeding about 470° C., followed by a longer fire-brick portion in which the shale is gasified by steam, the water gas and undecomposed steam passing upwards through the shale. Mechanical improvements have been made, but the costs, though reduced, are to some extent governed by the low throughput of about 4 tons of shale per retort per day, the shale taking 24 hours to pass through the retort. No better retort has been discovered than those now in use. Recent developments have, however, increased the throughput of the retort from 4 up to 12 tons of shale per day, this being achieved by the injection with the steam at the base of the retort of about 6,500 cu. ft. of air per ton of shale, a principle that was formerly thought to be entirely wrong. Without injection of air the shale fuses in the reducing atmosphere when attempts are made to increase the throughput by increasing the flue temperature. The new practice does not diminish the quality nor the yield of oil, but decreases the ammonia yield by 5 per cent. The refining of shale oil has been similarly developed. Originally the object was the production of burning oil, but to-day a wide range of products is produced consisting of motor spirit, solvent naphtha, burning oil, gas oil, wax, light lubricating oil, and fuel oil. The paper by Dr. G. H. Smith and Mr. W. V. Peutherer shows that this side of the industry has been developed on sound chemical lines which take into account the newer methods of the petroleum chemist. Shale oils have a similarity with petroleum in that they can generally be classified as paraffin, mixed or asphaltic base, but they all contain a considerable proportion of unsaturated hydrocarbons.

Attempts are being made to apply the newer processes of cracking, hydrogenation, and snythetic oil production from water gas to the shale oil industry. Dr. Egloff and his collaborators believe that the future of the oil-shale industry to a great extent depends upon the profitable conversion of the shale oil into motor fuel. Their experience shows that the modern cracking process can be adapted to convert most shale oils into similar products to those which are obtained when cracking petroleum, but with somewhat smaller yields. The chief difference between shale oils and petroleum is the presence in shale oils of oxygen—and nitrogen—containing compounds generally consisting of tar acids and bases which are corrosive to steel, particularly at high temperatures, and cause a reduction in the anti-knock values of the petrol. Mr. Pier has shown that shale oil can be hydrogenated into motor spirit with a yield of more than 100 per cent. by volume. An interesting suggestion made in this paper is the use of extraction processes such as the Pott-Broche to remove the oils previous to hydrogenation. Experiments show that with an extraction temperature or 410° C. and at 80 atm. pressure, and Estonian shale gave 67 per cent. of extract as against 53 per cent. by carbonisation.

Figures given by Dr. A. J. V. Underwood show that oil shales and cannels can be treated by a combination of processes involving distillation, hydrogenation, and in the case of cannel, treatment of the coke from the retorts by the Fischer-Tropsch process. It is a weakness of this conference that no paper has given any indication of costs—past, present or proposed.

It is necessary for every employer to carefully consider in what respect the Factories Act will affect him and to take the necessary steps to comply with the same. Those firms who do not trouble to fully comply with the Act may find themselves mulcted in damages and the cost of their insurance increased over that of their competitors in the same industry.

—*Sir Stanley Machin.*

Notes and Comments

Chemical Descaling

AN interesting example of chemical descaiing was given in Mr. Hawkyard's paper on " Works Control " presented at the 75th annual meeting of the Institution of Gas Engineers. The efficiency of a condenser diminished rapidly, and this was found to be due to a deposition of scale on the tubes, although the water temperature rarely exceeded 140° F., which had been accepted as a minimum temperature for scale formation for a closed circuit. The tubes were descaled by circulating a dilute solution of hydrochloric acid containing 0.25 per cent. of HCl and 0.025 per cent. of bone size. The first application removed the weed and slime together with part of the scale. A second treatment removed the remainder of the scale. The maximum thickness of the scale was 3/32 in., but since the acid had to be circulated over the heavily-scaled cooling tower as well as in the condensers the total consumption of acid was 15 tons. It was evident that it would not be possible to descale at this cost periodically, and the trouble was obviated by using softened water and installing a third condenser. The first condenser in the series uses circulated softened water, and the second and third are fed with softened water, the warm water from these two last-mentioned condensers being used as feed water for the boilers. A separate supply of cold softened water is used for make-up for the circulatory system.

Iron Bacteria in Well-Water

MR. Hawkyard's paper also contained an experience in dealing with iron bacteria. Considerable trouble was experienced with one of the wells at Tottenham gasworks, the borehole of which was infected with iron bacteria. The bacterial filaments were filtered out by the softeners and formed an uneven layer on the surface of the zeolite, causing irregular distribution of the water through the softener beds. Attempts to sterilise the borehole proved ineffective but the growth was ultimately controlled fairly successfully by continuous chlorination of the water at the well-head. The dead bacteria still collected in the softeners, but the layer did not adhere to the softener bed and was easily removed by back-washing. A Wallace and Tierman chlorinator was used, and the dose was regulated to maintain a free chlorine content of 0.2 parts per million in the water at the softener inlet. The chlorine consumption was about 0.5 parts per million of water raised.

Improving Industrial Relations

IN the second of the Heath Clark Bequest lectures, recently delivered under the auspices of the National Institute of Industrial Psychology, Dr. C. H. Northcott, labour manager of Rowntree and Co., Ltd., made a plea for a larger measure of democracy as a contribution to sounder industrial relations. Industry existed to produce goods and render services. It was an adventure in co-operation. Its purposes could be achieved more satisfactorily if a larger measure of democracy were introduced. Men worked better when they felt themselves partners in an enterprise, at least in the sense that what was done within it was with their knowledge and goodwill. There were, however, obvious limits to what was feasible in the form of industrial democracy. No amount of mutual goodwill could overcome a fundamental diversity of interests or make up for defects of knowledge and capacity. If discipline were to be weakened by the use of democratic machinery, it would be at the risk of inefficiency and possible bankruptcy. But disciplinary methods which produced discontent could not be enforced, and a sympathetic public opinion would not tolerate obvious unfairness. Nevertheless, it would be possible to give workers a measure of democratic control by drafting factory rules in mutual agreement with them, by consulting their representatives before appointing a foreman and by providing an impartial court of appeal for disciplinary offences upon which they would be adequately represented. A number of firms had already made experiments of this kind and reported that efficiency had been promoted and industrial harmony increased.

Outstanding Tribute to Sir Ernest Benn

THE CHEMICAL AGE takes natural pride in the award of the Publicity Club Cup to its chief proprietor. At the gathering at the Mansion House at which the presentation was made by the Lord Mayor of London, acknowledgment was made in handsome terms of Sir Ernest Benn's contribution to the higher status to which advertising has been raised. His presidency of the Advertising Convention cruise to the Northern Capitals in 1936 was singled out for specially warm commendation, and it was fitting that this tribute should have been paid in the presence of Lady Benn, whose gracious support gave the finishing touch to a conspicuous success in national publicity. Those who have worked alongside Sir Ernest Benn have the best reason for appreciating the bestowal of the trophy which is now proudly displayed in the reception room of Bouverie House. They know that he will never compromise with the high standard he has set for nearly fifty years for the conduct of the advertisement departments of his own business. They rejoice to think that it is this very staunchness to his ideals as an advertising man and a journalist that has brought him not only his eminent position in the contemporary world, but has stamped with success a life work resolutely pursued for the benefit of their common calling.

German Overseas Trading Methods

AN illuminating correspondence has appeared recently in *The Times* with specific reference to motor-cars, but which is probably not without its bearing on other goods. The President of the German Chamber of Commerce for the U.K. stated that there is " definitely no payment of a German subsidy, but it is true that the German motor-car industry sets aside a certain percentage of its turn-over to foster export trade." It has been suggested that since plant used for motor-car production could be used for armaments also, other nations should do all in their power to discourage the purchase of German cars in other countries. To this, the Society of Motor Manufacturers and Traders replies that the German Government compels and directs the distribution of the subsidy funds so that the U.K. motor industry is faced with a regimented competition of an exceptional character, which demands adjustment of tariffs to meet it. If a nation is prepared to pay more for its own cars individually, and not through taxation, there seems no objection to providing a subsidy within the trade to assist foreign business—indeed we might ourselves take a leaf out of the German book. It is clear that industrialists generally could do much to help international peace if they would make such agreements and arrangements as would get international trade moving freely again. Let us stop talking of armaments and get back to commerce.

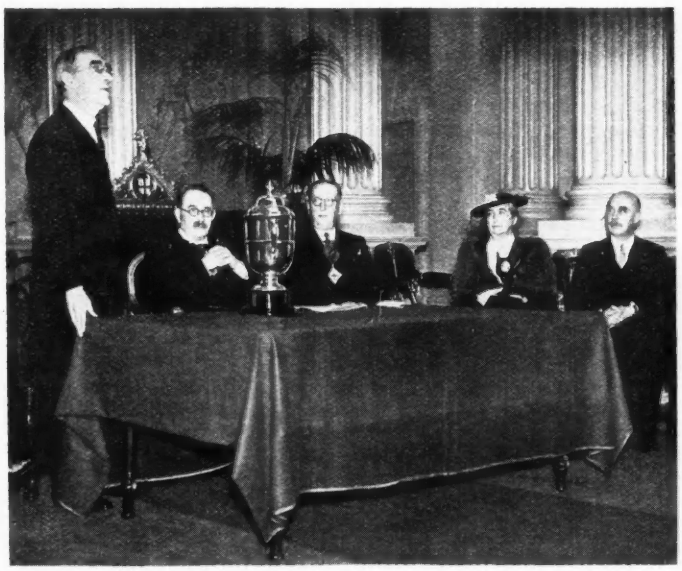
Sir Ernest Benn Receives Publicity Club Cup

Presentation by Lord Mayor at Mansion House

SIR ERNEST J. P. BENN, Bart., C.B.E., Chairman of Benn Brothers, Ltd., was presented with the Publicity Club Cup awarded to him by the Publicity Club of London, for his notable services to advertising, by the Lord Mayor of London (Sir Harry Twyford) at the Mansion House on Monday.

Mr. W. Buchanan-Taylor (Chairman of the Publicity Club) presided over a large gathering of members and friends, supported by Lady Benn, the Lord Mayor, Mr. Sinclair C. Wood, F.I.P.A. (cup holder for 1936-37), and Sir Stephen Tallents.

Opening the proceedings, MR. BUCHANAN-TAYLOR said that they knew Sir Ernest Benn as a high-minded business man, accomplished economist, deprecator of sham and pretence, generous employer, and, withal, a high type of British democrat. He had heard Sir Ernest on many occasions and on many subjects. He had an expansive vocabulary, knew how to use his words, and, perhaps better still, understood what they meant. (Laughter). He (the speaker) was not on the famous Voltaire trip to the Northern Capitals, but he was given to understand by everybody on that trip that its success was almost entirely due to Sir Ernest and the work he put in on the journey.



Sir Ernest Benn speaking after receiving the Publicity Club Cup. Seated (left to right) are the Lord Mayor (Sir Henry Twyford), Mr.W. Buchanan-Taylor, Lady Benn and Sir Stephen Tallents.

They knew his contributions towards advertising and to the solution of its many problems, and that was why the members of the Publicity Club had decided to award him that signal honour. The Publicity Cup was originally presented by Mr. Robert Thornberry, and it was intended to be a symbol of the Publicity Club of London's objective to raise the status of advertising, to be awarded for some outstanding effort on behalf of advertising. Sir William Crawford, Sir Charles Higham, Sir Stephen Tallents, Mr. Sinclair Wood, the late Mr. Horace Imber, the late Mr. Thomas Russell, Mr. J. C. Akerman, and Mr. John Cheshire were previous holders of the trophy, whose names would give them some idea of the calibre of the award and what it stood for.

Handing the trophy to Sir Ernest, the LORD MAYOR said that they all knew his great record in public life. They could learn a lot from "The Confessions of a Capitalist." They knew that with quiet efficiency, Sir Ernest had given many proofs of his ability to rank as one of the great leaders of advertising. He was an ideal president during his terms of office with the Advertising Association. He was a splendid leader of the Advertising Convention at the time of its visit to the Northern Capitals. He had done much by his speeches and writings for the club movement, and had rendered great services to advertising by speaking at conventions in different parts of the country. He was chairman of the biggest trade paper house in Europe, and head of the United Kingdom Provident Institution, and the many other enterprises with which he was associated included the Boys' Hostels' Association. Despite his numerous activities, however, he had been extraordinarily self-sacrificing on behalf of advertising. It was surely no small record and no small burden of responsibility for a man to carry.

It was said long ago that commerce flourished by circumstances, but to-day it lived by advertising. No one had been more ready to recognise that than Sir Ernest and he had been wholehearted in his efforts to assist the profession and calling to advertising and to establish its place as the very corner stone of national commerce and prosperity.

SIR ERNEST BENN, responding, said that it was a great thrill for a loyal freeman and a humble liveryman of the Worshipful Company of Stationers and Newspaper Makers to find himself summoned to the Mansion House to appear before the chief magistrate to receive from the historical descendant of Dick Whittington such recognition that his work and labours in his calling and craft had been of a satisfactory kind. It was rather a pleasant thought to him. It was nice to know that a good public service could be rendered by the apprentice or the journeyman in his craft or calling and that a good public service was not entirely rendered by those who busied themselves with rates and taxes. (Laughter). He was immensely proud of the honour which had been placed upon him, but he disclaimed altogether that he had done anything which any advertising man would not be glad to do and was doing in his ordinary work. They heard to-day a good deal about idealogy, but in advertising they had a better understanding and a better perspective of it, because in a way they combined the lot. There was a curious difference between the calling of advertising and most other callings. If a tailor was fortunate enough to secure a customer and to satisfy him, that custom would be withdrawn from the market because the customer would not be of any use to other tailors; but if an advertising man introduced someone to the joys of advertising, he might make a pound for himself and he might lose a pound, but in any event he would have started the man on a career in which the whole of advertising would participate.

A vote of thanks to the Lord Mayor was proposed by MR. SINCLAIR WOOD, who said that when advertising people came into the Mansion House and into the presence of the Lord Mayor, they came into the brain-centre of one of the most successful of all advertisers. He very much doubted, however long they might go on, whether they would be able to put across anything with the success with which the City of London had been put across for 500 years.

Sir Stephen Tallents seconded the motion, and responding, the Lord Mayor said that he thought he could claim to be an advertising man, because throughout his year of office he had advertised for contributions to the fund for the assistance of Chinese refugees, and up to the moment approximately £130,000 had been received. (Applause).

Cleaning Building Stones

Investigations at the Building Research Station

DIFFICULTIES experienced in cleaning ancient stone masonry without damaging it, have led to experiments which demonstrated that soot and dirt can be removed with ease from soot-blackened limestone, if the dirt is first softened by applying to it a fine, misty spray of water for a suitable time, states the report of the Building Research Board for 1937 (Stationery Office, 3s. 6d.).

During 1937, the promise of these laboratory experiments has been confirmed by practical trials on buildings. Preliminary tests, arranged through the Office of Works, were carried out on three buildings in London, two of Portland stone, each about 70 years old, and one, about 100 years old, of Bath stone. After spraying for one hour, it was found that the Bath stone could be brought to a good appearance by light brushing. After two hours, apart from its weathered appearance, the condition of the masonry could hardly be distinguished from new stonework. Equally promising results were obtained on Portland stone.

These trials were so satisfactory that the Office of Works decided to proceed with the complete cleaning of the Bath stone building and one of the Portland stone buildings. The results on the Bath stone building were very satisfactory. Delicate carving on parts of the face of the building, which could not have been cleaned by the old method of scrubbing with water, except by vigorous brushing involving some risk of damage, has been cleansed with ease and without injury by the spray method. The Portland stone building, which is situated in the City of London, was exceedingly dirty: the soot was greasier and more difficult to remove than on the Bath stone. But even here, most of the soot and dirt could be removed with ease after spraying for an hour or two.

For the cleaning of buildings, the Building Research Station has advocated the use of plain water only, but objection has been raised to this method of cleaning on account of the scrubbing that may be involved. The spray method meets that objection and there is certainly no justification for using caustic soda or other harmful chemicals on the plea that they facilitate the cleaning process or minimise the risk of immediate damage.

Iron and Steel Developments

A New Industry for New Zealand

THE New Zealand Government has passed a Bill authorising the establishment of an industry for the manufacture of iron and steel under the control of three commissioners. The commissioners will be appointed for a period not exceeding seven years, but may be re-appointed. They will be required to devote the whole of their time to the duties of office. They will have the authority (1) to mine for coal or any minerals required for the production or manufacture of iron or steel: (2) construct, erect, acquire plant machinery, tramways, ships, etc.: (3) purchase or acquire patents, licences, etc.

Numerous attempts have been made to manufacture pig iron in New Zealand but non has been really successful. The Onakaka Iron and Steel Co., Ltd., went into liquidation in March, 1931,, after a chequered career. The company found that the market for the pig iron produced from one blast furnace was decidedly limited and to improve the position spent a large sum on the installation of a plant for the manufacture of cast iron pipes from 4 in. to 24 in. diam. Hopes for improvement in the company's position, however, did not materialise and operations were carried on spasmodically, and finally ceased in 1935.

The present proposal is to establish the works at Onakaka with a capacity of 85,000 tons of finished steel.

Inorganic "Phosphors"

Preparation without Use of Activator

THE preparation of inorganic "phosphors" (fluorescent compounds) without a metallic activator is reported by Byler (*J.A.C.S.*, 1938, *60*, 1,247-1,252). Substances were found to become fluorescent when heated just above a transition or decomposition temperature. Thus barium chloride became fluorescent when heated above its transition temperature, so that it was partially converted to its allotrope; the hydrated sulphates of zinc and magnesium, and strontium chloride, behaved similarly when heated to partial dehydration.

A detailed study was made of the behaviour of some of the calcium phosphates. A fluorescent product could be obtained by precipitating the dibasic phosphate from calcium chloride with sodium phosphate at a pH of 5.5, followed by washing and firing. The optimum temperature of firing was 400°, and X-ray examination of the product showed that it was a mixture of the dibasic phosphates and another compound, presumably the pyrophosphate. Products of much higher fluorescent power could be obtained by washing the phosphate precipitate with dilute hydrochloric acid, in which case the extent of the fluorescence developed was very sensitive to the pH and amount of the wash water. When hydrochloric acid of a pH of 3 was used, the optimum effect was obtained, provided the amount of washing exceeded a certain figure. Similar results were obtained by performing the precipitation in solutions of a different pH.

Products of equal fluorescent power to the last were obtained by precipitating hydroxy-apatite, $3Ca_3(PO_4)_2.Ca(OH)_2$, by adding normal sodium phosphate to an ammoniacal solution of calcium chloride and ageing the product in dilute phosphoric acid solution. Here again the pH and time of ageing were found to exert a profound influence on the extent of the fluorescence developed when the products were fired; 10 hours at a pH of 2.3 was found to be most efficient treatment. In all cases 400° C. was the best calcination temperature, and in most cases X-ray examination showed the products to be mixtures.

It was concluded that fluorescence of inorganic compounds, in the absence of the usual trace of a foreign ion, results from the formation of a mixture of two related compounds of critical composition, in which the crystal structure is distorted from that of either of the two pure components.

Italian Chemical Industry

Recent Expansion Reported

DURING the period of sanctions in 1935 and 1936 the Italian chemical industry was organised to achieve as far as possible a production sufficient to cover national needs in both range and quantitative requirements, according to a report from the American Commercial Attaché, at Rome. Complete data on the expansion are not available, but the index of chemical production for 10 principal items showed 93.1 for 1935, 107.4 in 1936, and 133.2 in 1937 (1928=100). Production of synthetic organic colours, which was 84.4 in 1936, reached 124.9 in 1937. The number of operatives employed in the chemical industry in December, 1937, was 73,891 compared with 62,279 in December, 1936 and 40,324 in December, 1934. During the last two years, production of sulphuric acid has increased about 60 per cent. to a total of 1,600,000 metric tons in 1937. The Montecatini plant, at Merano, trebled its output of methanol during 1937, and further developments are expected to take place. A plant for the manufacture of formaldehyde, used in explosives, is being constructed. A lithopone plant also under construction will have a capacity of 100,000 tons. The pharmaceutical group has added a series of alkaloids and synthetic products to its opotherapy preparations.

Income Tax Procedure

Change in Wear and Tear Allowances

A CONCESSIONARY alteration has been made in the Finance Bill, 1938, regarding provisions governing wear and tear allowances for machinery and plant by a yearly percentage allowance upon the written-down value of the items concerned. The percentage rates vary according to the type of machinery under review.

By the Finance Act, 1932, a general addition of one-tenth on ordinary rates was to apply to every industry; but in the current Bill this increase is to be one-fifth on ordinary rates. For example, where the ordinary rate is 20 per cent., with one-fifth added (4 per cent.), a total rate of 24 per cent. will now apply, instead of 22 per cent. as formerly.

The following rates apply especialy to the chemical and allied industries, the figures given being the total rates with the one-fifth added:—

Chemical manufacture: Chemical plant (not sulphuric acid plant), 9 per cent. Electrical plant, 9 per cent. Other plant, 6 per cent.

Sulphuric acid manufacture: Chamber process: nitre plant, ammonia, oxidation plant, towers and plant used in connection therewith, chambers and incidental plant, chimney stack, de-arsenicating plant, concentrating plant, 18 per cent. Contact process: towers, blower, grease separating and pressure balancing chambers, heat interchangers, preheaters, super heaters, converters and contact mass, absorption vessels, weighing tanks and machine plant for plantinisation and revivification of contact mass, 18 per cent. Either process: plant for dealing with sulphur raw material, mechanical and hand burners, power plant, acid eggs, storage tanks, cisterns, and connections, fans, pumps, railway tank wagons, 18 per cent.

Paint, colour and varnish manufacture: Engines, boilers, shafting and storage tanks, 6 per cent. General plant and machinery including grinding machinery and electric motors, 9 per cent.

Destruction of Paint Films

A Microphotographic Motion Picture Study

A MICROPHOTOGRAPHIC study of paint films which took nearly two years to make, yet taking only sixty minutes to be shown on the cinema screen, was exhibited before the Manchester Section of the Oil and Colour Chemists' Association by Dr. W. Krumbhaar and Dr. A. V. Blom, on Friday.

This motion picture gave truly spectacular details of the process of film formation, especially of peculiar surface irregularities, and showed the interesting formation of soap crystals in paint films. Furthermore it made visible the manifold phenomena of rust formation and corrosion on iron and metals and gave a unique insight into the forces of elastic tensions which are active during the breakdown of a surface coating.

Both ordinary and polarised light were used for the actual exposure of this film, depending upon the particular photographic effect wanted, and the speed of the reactions and processes presented by the microphotographic motion picture were adapted to the practical conditions of demonstration by optical and other methods. The choice of examples suitable for demonstration by motion pictures was made from a vast amount of microphotographic pictures of processes connected with the building up and the breakdown of surface coatings which had been taken under the auspices of Beck, Koller and Co., Inc., and under the direction of Dr. A. V. Blom, at the Swiss Bureau of Standards, in Zurich. They were arranged in five main groups, showing (1) molecular conditions of surface coating materials; (2) surface irregularities during film formation; (3) pigment reactions in the surface coating; (4) corrosion phenomena; and (5) mechanical details of a film breakdown.

Death of Professor W. A. Bone

An Authority on Coal and Combustion

WE regret to annonuce the death of Professor William Arthur Bone, emeritus professor of chemical technology at the Imperial College of Science and Technology, last Saturday, at the age of 67.

He was born at Stockton-on-Tees and was educated locally and at the Leys School, Cambridge. He subsequently entered the Victoria University, Manchester, graduating with honours in chemistry in 1891. In 1892 he was appointed Berkeley Fellow of Owens College and Fellow of Victoria University. After working under Victor Meyer at Heidelberg, he became head of the Chemistry Department at Battersea Polytechnic, which appointment he received at the early age of 25. He remained at Battersea for two years and then left to return to Manchester University as a lecturer in chemistry and metallurgy. Eight years later he was elected to the Livesey Chair of Fuel and Coal Gas Industries at Leeds University, and in 1912 became professor of chemical technology at the Imperial College of Science and Technology, South Kensington, which position he held until his retirement in 1936 when he was elected emeritus professor.

Professor Bone was president of the Chemistry Section of the British Association in 1915, chairman of the Association's Fuel Economy Committee from 1915 to 1922, and a member

Professor W. A. Bone.

of the Coal Conservation Committee. He was, without question, the leading authority on combustion in his time and will long be remembered for his pioneer work on the chemistry of coal, on flame propagation in gaseous mixtures, and on the hydroxylation theory of the combustion of hydrocarbons. As examples of his ingenuity might be quoted his invention of the Bone Court system of incandescent surface combustion, for which he was awarded the Howard Potts gold medal of the Franklin Institute, and of the Bone Wheeler combustion tube, devised in conjunction with Professor R. V. Wheeler. The honours conferred on him by the learned societies were a just recognition of the value of his work. He was awarded the medal of the Royal Society of Arts in 1922, the Melchett medal of the Institute of Fuel in 1931, the medal of the Society of Chemical Industry in 1933, and the Davy medal of the Royal Society in 1936. In addition to numerous contributions to the journals of the scientific societies, he was the author of several books which have come to be regarded as standard works in their respective fields, his most recent work being "Coal: Its Constitution and Uses" written in collaboration with Dr. G. W. Himus and published in 1936.

New Technical Books

THE PRINCIPLES OF MOTOR FUEL PREPARATION AND APPLICATION. By Alfred W. Nash and Donald A. Howes. Vol I. Second Edition. Pp. 628. London: Chapman and Hall, Ltd. 36s.

Because of its length, this work has been divided into two volumes, of which the new edition of Vol. II will be issued shortly. Volume I deals with the production of motor fuels by methods of distillation, cracking, extraction from natural gas and hydrogenation. It also contains chapters concerning the production of benzole, various synthetic fuels, including alcohols, and general storage and distribution. Vol. II will deal with the properties of motor fuels and covers such subjects as analysis, sulphur contents, gumming properties, volatility requirements and knock ratings, as well as motor fuel and aviation spirit specifications, and a chapter on automotive diesel engines and diesel fuels. The chapters on the distillation of petroleum to produce motor spirit, the refining of this to market demands and the development of the cracking and hydrogenation processes, whereby the crude oil is made to yield even more spirit than it originally contains, by conversion of the heavier oils, will additionally serve to bring home to the layman the vast work and capital expenditure involved in maintaining at each wayside petrol pump a constant, standard and reliable supply of motor fuel. Alcohol fuels, which derive importance in many countries where intensive nationalism is the order of the day, and synthetic motor fuels, are dealt with somewhat more fully; the authors' researches in this latter field have enabled them to include their own conclusionus. Since the publication of the first edition in 1934 rapid advances have been made in the production and utilisation of motor fuels, with the result that some of the material in the first edition is now out of date, and it has been necessary to make certain alterations and additions. A new chapter on pyrolysis and polymerisation processes has been added, while the latest developments in other fields have also been covered.

THE CHEMISTRY AND TECHNOLOGY OF RUBBER LATEX. By C. Falconer Flint. Pp. 715. London: Chapman & Hall, Ltd. 42s.

This comprehensive yet readable treatise has been written as a practical guide for those who handle latex in the factory and laboratory or are concerned with its production or distribution, and also as a book of reference for all who are interested either technically or scientifically in the subject. The first third of the book deals in detail with the historical aspect of the subject, the source, composition and properties of latex, the manner in which it is handled on the plantation, and, in general, with the treatment of the product up to the time of its arrival as a raw material at the works of the consumer. Incidental questions, such as the preparation and the use of powdered rubber, are also treated. The remainder of the book is concerned with the industrial applications of latex. The various branches of manufacture are made the subject of general discussion; practical working instruction and detailed formulæ are given, while the relevant patent and technical literature is also reviewed. Artificial dispersions of raw and reclaimed rubber, the new synthetic latices, and the physical testing of latex rubber are also dealt with in some detail. There are abundant references to the literature of the subject, the most recent being to publications which appeared in the second half of 1937. These references are distributed in the text, indicating immediately to the reader the sources from which information has been taken, and whence further details may therefore be obtained. Such a scheme, which is usual in scientific publications, is of much greater service to the reader than mere bibliographical lists. An acknowledgment is made to M. Genin's well-known book "Chimie et Technologie du Latex de Caoutchouc," which was published in 1934. By arrangement with M. Genin, Dr. Falconer Flint has translated the original volume, modified it by addition or deletion to agree with subsequent technical progress or with his own personal experience, and has then used it as the framework for the present more comprehensive and practical publication. The book is fully illustrated with photographs and diagrams.

THE FINE STRUCTURE OF MATTER. Vol. II, Part II: Molecular Polarisation. Vol. II, Part III: The Quantum Theory and Line Spectra. By C. H. Douglas Clark. Pp. 643. London: Chapman and Hall, Ltd. 2 vols. 15s. each.

The progress of atomic and molecular theory in recent times has proved remarkably rapid and extensive. It has become increasingly difficult, though surely not less important, to correlate work carried out in different branches. It is in the hope that these diverse researches may be enabled to be considered more readily in inter-relation with each other and in respect of the effect of each contribution to the whole that the author has essayed the present task—a work which attempts to view the situation along various avenues of approach. The general plan is that of separate volumes bearing individual titles, each volume being as far as possible complete in itself as an expression of some leading thought. The first three volumes are intended to deal with different aspects of more purely physical questions. Further volumes are in contemplation, which shall be descriptive of matters of special chemical importance. Part I is devoted to a discussion of crystal and related structures as determined by X-rays. The Debye theory of polarisation, Fajans' theory of deformation, and the derivation and meaning of dipole moments, form the leading themes of Part II. Discussion of the result of spectroscopy is commenced in Part III, with special reference to newer adaptations of the quantum theory in relation to line spectra. References to the original literature necessarily occupy a considerable amount of space.

COMBUSTION, FLAMES AND EXPLOSIONS OF GASES. By Bernard Lewis and Guenther Von Elbe. Pp. 415. Cambridge University Press, 21s.

The interest in combustion phenomena, shared alike by chemists, physicists, and engineers, has led to a large number of investigations which vary widely in purpose and accomplishment as well as in actual scientific value. The need was for co-ordination and critical appraisal of these recorded investigations; this is the first purpose of this book. Secondly, believing that well-founded speculation has great value as a stimulus to further research, the authors have not hesitated to express rather definite views on some highly controversial subjects. These views are given with full reasons for their adoption, but the authors invite any disagreement that is based on logical alternatives. The book is in four parts: Chemistry and kinetics of the reactions between fuel gases and oxygen; propagation of flames; state of the burnt gas; problems in technical combustion processes. Some fundamentals in kinetic and thermodynamics have been included, which it is hoped will be sufficient to relieve the reader who is inexperienced in these fields of the necessity of consulting special texts. In the development of the equations for calculating ideal flame temperatures, explosion pressures and expansion ratios, it has been the aim to exercise the utmost economy in symbols. The influence of electric fields on flame propagation, although occupying a separate chapter, has been treated only briefly, since the authors consider it to be a specialised subject with little bearing on the normal case of fieldless flame propagation. A similar brief mention has been made of industrial heating operations. The values of flame temperatures of various combustible gases and mixtures of them, although they are approximate, and inflammability limits of various gases and vapours contained in the appendices, should prove of practical value.

Special Lead Section

A REVIEW OF THE APPLICATIONS OF LEAD AND ITS ALLOYS AS CONSTRUCTIONAL MATERIALS IN THE CHEMICAL INDUSTRY

Foreword

By F. H. A. MACKRILL, Chairman of the Sheet and Pipe Committee of the Lead Industries Development Council

LEAD possesses a combination of properties which makes it particularly useful in the chemical industry, and its resistance to corrosion, flexibility and low melting point mean that it is not only useful but eminently usable—easily worked, moulded, shaped and jointed and ideal for homogeneous applications.

This combination of properties made it indispensable in chemical production long before the industry reached its present magnitude, and modern developments and increasingly exacting requirements have not in any way lessened its usefulness. On the contrary, lead is more indispensable now than ever before, and with the energetic experimentation of the lead industry there is no reason why it should ever begin to make itself less useful to the chemical industry.

British chemical lead has attained a very high reputation all over the world. It is purified to an almost absolute degree and lead manufacturers to-day guarantee a purity of 99.99 per cent. in quantities equal to any conceivable demand. This is chemical lead, type "A," B.S.I. Specification No. 334 (1934). In order to reinforce the valuable working properties of lead, however, various lead alloys have been developed, chiefly tellurium lead which possesses a very much greater tensile strength and fatigue resistance. These alloys represent type "B" of the Specification—"chemical lead containing protective elements"—and are the major contribution in recent years of the lead industry to the chemical industry.

The extensive research of the British Non-Ferrous Metals Research Association and the general activity of the lead industry, especially through the Lead Industries Development Council, which represents substantially all the manufacturers of lead and lead products, has been of inestimable service to all users of lead in adapting the material to new requirements and perfecting and revising practice for improved performance. The work of the Council in particular has been directed to establishing reliable and accessible information for users and potential users of lead—a service of high practical value with a material where the cause of failure is almost invariably faulty application and not faulty material.

These activities have placed the lead industry—one of the oldest established industries in this country—among those energetically developing and progressive industries which are so strongly represented in the chemical world. And with a material of such practical utility and versatile applications, its contribution to the chemical industry will continue to be as indispensable as it has always been.

Some Applications of Lead in Chemical Engineering

By A. G. WRIGHT

LEAD, as a chemical engineering material, has three important points. It offers good resistance to the corrosive action of a number of chemicals—especially to sulphuric acid, which is a feature of the greatest importance in industry. Secondly, the metal in the form of sheet or pipe is pliable and easily fabricated into different shapes. Thirdly, where corrosion becomes especially severe any repair work is done easily by lead burning, irrespective of whether a patch has to be applied or a weak pipe thickened up. In addition, plant which is made of lead can be easily adapted for alterations, due to the good working qualities of the metal. For chemical engineering purposes there are several very distinct types of lead—not mere variations of chemical composition as in the case of other non-ferrous metals and their particular range of alloys. There is chemical lead proper, the composition and properties of which have for long been detailed in one of the British standard specifications; a harder variety, known as hard or antimonial lead, which is lead combined with antimony in varying proportions (3 to 10 per cent.) to meet particular needs; and, of more recent introduction, a material with a greater tensile strength and more resistance to fatigue and corrosion, known as tellurium lead. For certain purposes lead alloys containing both tellurium and antimony, or tin, are also available.

To a certain extent the actual applications for lead in chemical engineering are not so very numerous. The quantities of metal used, however, are enormous, mainly due to the fact that lead is practically indispensable at sulphuric acid works and in the handling of sulphuric acid in subsequent chemical manufacturing wherever sulphuric acid takes an important part in the reaction. The manufacture of phosphoric acid also calls for lead constructions to a notable extent, and the manufacture and handling of hydrofluoric acid provides another demand though of much lesser extent. At chemical works, considered apart from sulphuric acid works, sulphonating and chlorinating processes in the organic chemical industry provide the largest demand. Among allied industries there is paper manufacture, lead being used especially at mills operating the sulphite process.

The general softness of the metal and its tendency to sag under the influence of its own notably high weight, was for a long time a disadvantage which possibly prejudiced the use of lead in the construction of plant for chemical operations which were not definitely sulphuric acid in character; indeed even in plant for the manufacture of sulphuric acid special constructional details have been necessary on this account. During the last fifteen years, however, trouble due to sagging and blistering where lead was used as a loose internal lining to a steel or cast iron vessel have been overcome by the introduction of what is called a "homogeneous lining"; here the union between the steel (or cast iron) shell and the lead lining is so perfect that lining and shell are inseparable even under vacuum and temperature variations up to within a few degrees of the actual melting point of the lead. This homogeneously lead-lined plant has now proved to give trouble free service wherever certain corrosive liquors are continuously present. In consequence, the introduction of this form of lining has caused lead to be used in a much wider circle of applications where sulphuric acid is in evidence, and even in other directions where excessive upkeep and replacement costs due to outstanding cases of corrosion has made it necessary to seek a better material.

In this connection the dyestuffs industry has been affected to a noticeable degree, for there is no greater need for good corrosion resistance than in plant which is engaged in the manufacture and the actual use of dyestuffs. In the first case product purity must be preserved; secondly there must be no risk of the dyestuff becoming affected by corrosion products from the metal of which the dyeing equipment is made. Tanks, kettles, agitators, dyeing vats, heating coils, etc., when homogeneously lined or coated with lead all help the dyestuff producer to maintain product purity and also a reasonable price for the dyestuff by reducing the cost of upkeep for the manufacturing plant, wherever lead gives the best corrosive resistance in the dyestuff or dyestuff intermediate manufacturing reaction.

Chemical lead can be recommended for its resistance to sulphuric acid at all concentrations and temperatures, excepting 95 per cent. acid above a temperature of 158° F. Hard lead is similarly suitable, excepting for 95 per cent. acid above 158° F. and acid of greater concentration than 25 per cent. at boiling point. Tellurium lead, generally considered, is suitable in the same cases as given for chemical lead. Corrosion by acid mixtures varies considerably according to the proportion of sulphuric and hydrochloric acid, or sulphuric and nitric acid; in the former case with the hydrochloric acid, increasing from 2 per cent. to 18 per cent., simultaneously with the decrease of sulphuric acid from 18 per cent. to 2 per cent., the rate of solution of lead will increase from 300 milligrams to 13,000 milligrams per square decimetre per day. For mixtures of sulphuric and nitric acid varied inversely in the same way between 2 and 18 per cent., the rate of solution will be very great, a minimum of about 24,000 milligrams per square decimetre per day applying in the case of a mixture of 18 per cent. sulphuric acid and 2 per cent. nitric acid. The corrosion of hard antimonial lead by hydrochloric acid can be taken generally as equal to a rate of solution of 10 milligrams per square decimetre per day for acid up to 5 per cent. concentration at a temperature of 70° F., which increases to 20 milligrams when the concentration of the acid reaches 10 per cent., and to 100 milligrams at 35 per cent.; at boiling point the respective figures will rise from 10 milligrams with acid of 1 per cent. concentration to 250 milligrams for 35 per cent. acid.

Corrosion by Phosphoric Acid

The production of phosphoric acid has found a favourable use for lead in many stages of the wet process. It is used chiefly at the preliminary stage when the phosphate rock and sulphuric acid are allowed to interact, and here its good resistance against both acids is an able recommendation, because even if lead is resistant to two distinct acids individually it does not always follow that it can be used in contact with mixtures of the same two acids. For instance, lead is resistant to phosphoric acid and also to hydrofluoric acid, but it does not prove suitable for hot solutions of crude phosphoric acid containing fluorides.

The manufacture of aluminium sulphate involves certain constructional problems for which no completely satisfactory course has yet been found. So far as corrosion is concerned hard lead containing as much as 6 per cent. of antimony proves to be very good for all strengths of solution, but it still has its limitations in view of erosion and creeping. Nevertheless, hard lead continues to be used, because it can be patched and repaired economically whenever necessary. Tellurium lead here seems to have good possibilities, but it is a little too early to say how its life in an aluminium sulphate plant will compare with equipment made of hard antimonial lead.

Reaction agitators which come in contact with hot sulphuric acid and strong solutions of aluminium sulphate at boiling point, and which, moreover, have the added troubles of erosion due to siliceous residues in suspension, have to provide the hardest-service. These are mostly made of steel which is lined with lead and then provided with an inner lining of acid-proof brick, the layer of lead which is sandwiched between the steel and the brick giving protection to the steel from the point of view of corrosion and the acid-proof brick eliminating the erosion trouble so far as the lead is concerned. This is a particularly novel instance of the application of lead in chemical engineering, and is one which might be commended for consideration in other cases of chemical engineering practice. For evaporators engaged in concentrating aluminium sulphate liquor, and alums generally, lead is undoubtedly the best material to use, being far more satisfactory than acid-proof brick and tile linings because these often show a tendency to break up after being in use for a short time. Due to the temperature conditions which apply in this case, i.e., an evaporator, it is necessary to use a homogeneous lining, because a loose lining of lead would expand and develop blisters and folds with a consequent weaking of the thickness of the lead and also the ultimate possibility of acid liquors creeping between the lead and the steel, so giving rise to corrosion troubles.

Ammonium Phosphate Manufacture

There are also a number of applications for lead and lead-lined plant in a manufacture of ammonium phosphate. The "mono" ammonium salt, $NH_4H_2PO_4$, has a pH value of 4.4 and is extremely corrosive, and in its preparation from wet process phosphoric acid both sulphuric and fluosilicic acids are present as impurities. The "di" ammonium salt, $(NH_4)_2HPO_4$, with pH value of 8.0, is much more balanced, but is somewhat unstaple at elevated temperatures and distinctly alkaline. In both cases lead-lined and brick-lined tanks are used for saturators; cast lead or a homogeneous lead-lined steel body is used for evaporators, which usually have stainless steel tubes. Acid feeders for the plant used in making the "mono" salt take the form of lead-lined tanks provided with a feeding mechanism made of cast lead. Pumps made of cast lead or homogeneously lead-lined (pump body and impellor) are often necessary.

The productions and handling of bromine provides another important application of lead plant, although of very minor dimensions by comparison with sulphuric acid manufacture—the chief and by far the most outstanding of applications of lead in chemical engineering. Lead proves to be satisfactory in contact with bromine which is free from acid and also relatively cold, but the life of the metal is seriously shortened when water is present. Actually corrosion resistance, in the case of bromine, is provided by the formation of a deposit of lead bromine, and unfortunately, under certain conditions, this deposit is liable to become detached, not so much to the detriment of the actual vessel or pipe, but mainly because the deposits are carried to other parts of the plant where they cause trouble by choking valves and pipe bends. Nevertheless, lead is rather essential for certain cases where bromine is in evidence, namely, those circumstances where the particular design of the plant makes it difficult, or even impossible, to use glass on a large scale or alternatively a ceramic material.

In contact with chromates and bichromates lead becomes coated with a film of lead chromate which is also quite satisfactory from an anti-corrosion aspect, but—as in the case of bromine—there is again a tendency for this film to cause trouble, due to rubbing off or washing off and subsequently contaminating any chemical solution which is in the vessel or which is passing through lead pipes. There is, however, one particular instance where lead becomes more or less essential to obtain a long life for plant; this occurs where alkali bichromate has to be reduced with sugar and sulphuric acid, or sulphur dioxide, to produce the basic chromium sulphate for tanning purposes—a case where iron is unsuitable for the plant and the only alternative to lead is wood.

In the dyestuff industry sulphonation kettles are not always lined with lead; cast iron is generally used for mixtures of oleum and strong sulphuric acid. The use of lead is mainly determined by temperatures and concentrations, and past experience has often found special cases for recommendation.

Homogeneous lead linings have proved especially satisfactory for hydrolysis reactions which are carried out with dilute sulphuric acid at elevated temperatures and pressures.

Agitator tanks as used in the manufacture of phosphoric acid are often made of steel or wood, and lead-lined, the lead being protected from abrasion and from the action of fluorine by an inner lining of acid resisting brick, similar to the practice mentioned for aluminium sulphate. The agitator blades can be made of hard lead, and provided with an abrasion resisting face of alundum grains. Thickener tanks, made of wood, are also lined with lead, and have a rake mechanism with blades made of hard lead provided with a similar alundum facing. Lead-lined or brick-lined wood launders are used in preference to piping when possible; lead pipe would be satisfactory were it not for the fact that some of the solutions deposit a crystalline scale. Pumps for weak phosphoric acid can be made of hard lead, but strong phosphoric acid demands the use of special stainless steel. Evaporation is carried out in a cast lead or homogeneously lead-lined steel body, the tubes being made of lead-coated copper.

Omitting comments upon sulphuric acid works, it is useful to give a list of liquors which may call for the use of lead as a plant constructional material. Aluminium sulphate, ammonium phosphate, phosphoric acid, hydrofluoric, acid, bromine, chromates and bichromates, and dyestuffs, have already been mentioned; in addition, lead has been adopted for handling ammonium sulphate, sulphurous acid, chlorine gas, bleach liquor, sulphur dioxide gas, zinc chloride, phosphorus chloride, sulphuryl-chloride, ammonia vapour, dyestuff mother liquors, certain organics such as isopropyl alcohol, and sodium salts containing sulphur—sulphide, sulphate, sulphite, bisulphate, hydrosulphite and thiosulphate.

The Manufacture of Chemical Lead

Its Use in the Construction of Sulphuric Acid and other Plant

By P. PARRISH, F.I.C., M.I.Chem.E., M.I.Gas E., F.I.F., E.I.I.A.

IT was in May, 1936, that THE CHEMICAL AGE "Special Lead Section" appeared. Issued later in brochure form it was widely acclaimed as a valuable contribution to the literature of the subject, and one often noticed that it occupied a prominent place on the bookshelves of many chemical engineers in this country.

What have been the developments of the last two years, and what are the trends of the future?

Interpretation of the B.S. Chemical Lead Specification

There is reason to believe that the B.S. Specification, No. 334, providing, as it does, for two types of chemical lead—type A, representing a pure material, containing not less than 99.99 per cent. Pb, and type B, representing a chemical lead containing protective elements, has been of considerable service alike to lead and chemical manufacturers.

One not infrequently hears that the flash test is insisted upon as the primary criterion by which the suitability of chemical lead is to be judged, whereas it is certain that other tests, particularly exposure tests, to the combined gaseous, liquid and physical conditions to which the chemical lead has to be applied on the works, would be more indicative as a guide.

What is the value of a chemical lead to the sulphuric acid manufacturer, having a flash point of 310° C., if an exposure test reveals that the average loss per day is of the order of 3.0 milligrams per square centimetre?

The results of tests, as suggested by the B.S. Specification, must be intelligently interpreted, if they are to be of real value. Too often the flash test is a fetish, and is the least valuable of many tests that could be applied to determine its suitability for a specific purpose.

But the greatest problem of all to the sulphuric acid manufacturer is to ensure that large deliveries, say, 200 tons or so, effected in a comparatively short time (a month at most), are up to standard. Broadly speaking, there is no test for a pudding (the 200-ton delivery), except eating it!

The best a chemical manufacturer can do in the circumstances is to keep in touch with the lead manufacturer, to ensure that the virgin pig lead to be used is of irreproachable quality, to inspect the melting at the pot, the skimmings, the tapping to the casting plate, and the rolling of the block.

But the behaviour of chemical lead is alike interesting and curious. It is known that it fails, under inter-crystalline attack, and equally under fatigue and alternating stresses. The recognition of this fact has led to the manufacture of chemical leads in which protective elements are used in order to mitigate, as far as possible, the latter influences.

This has introduced a new technique. It is not an easy matter to introduce 0.02 to 0.03 p.c. of nickel, or 0.05 to 0.065 p.c. of tellurium, to virgin pig lead, and ensure that the alloy is of homogeneous chemical composition. What is necessary is to prepare a "king alloy," containing about 1 p.c. of nickel (presumably a similar technique is adopted in the case of tellurium). The *modus operandi* adopted in the preparation of the king alloy is to take a quantity of lead, melt it and raise it to a temperature of 700° C., and introduce 2 per cent. of nickel to the lead, stirring suitably. The king alloy should be poured and cast in pig moulds, the ingots being arranged in such a way that they can be subdivided in quantities of about 2 lb. up to 20 lb. Any such ingot will contain, when there has been sufficient experience of the technique, about 2 per cent. of nickel, so that one can be certain to have, in a 10-11 lb. ingot, a quantity of 100 grams of nickel.

The next procedure, in order to fabricate say an "Edelblei" chemical lead (the manufacture of such a lead is covered by a British patent), is to melt, say, 2,150 lb. of Tadanac lead, to raise its temperature to about 400° C., and then to add three ingots of the king alloy, of about 10-11 lb. each, ensuring that the three ingots in question are stirred and dispersed throughout the mass of lead. Working in this way, it will be found that the final lead—"Edelblei" chemical—contains approximately 0.03 per cent. of nickel, and that it can be cast and rolled in the usual way. The preparation of such a chemical lead costs, taking the licence into consideration, something of the order of £1 per ton more than the ordinary chemical lead.

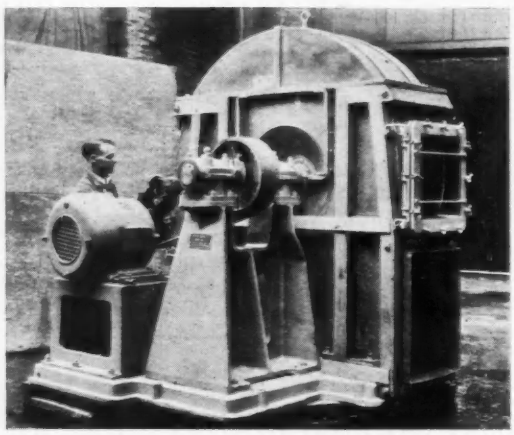
The grain size of Tadanac pure ingot lead is of the order of 400 to 1,000μ. How this can be improved by the introduction of nickel in the manner just described is obvious, when it is known that "Edelblei" chemical lead has a grain size of about 40 to 150μ.

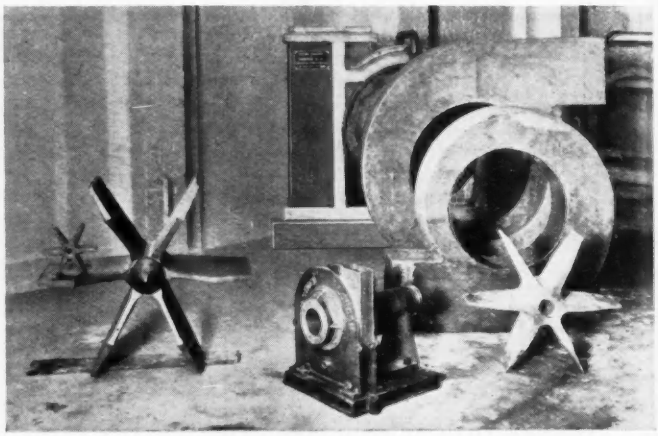
As regard mechanical and physical tests for chemical lead: a paper read about 1934 by Prof. Bernard P. Haigh, D.Sc., and Mr. Brinley Jones, was designed to evoke some expression of opinion from one of the learned societies about standardisation of physical tests as affecting lead and lead alloys. The desire was to obtain uniformity of interpretation.

While the British Non-Ferrous Metals Research Association has conducted private tests, with a view to determining the tensile strength and elongation of nickel, tellurium and ordinary chemical leads, there are many factors, such as

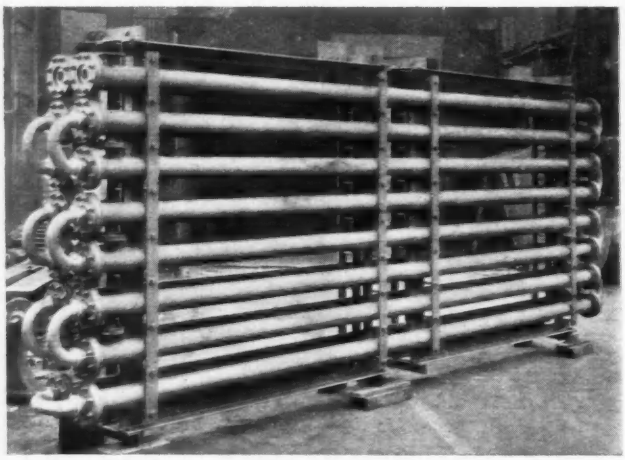
(*Continued on page* 486.)

Some Modern Uses of Lead and Lead

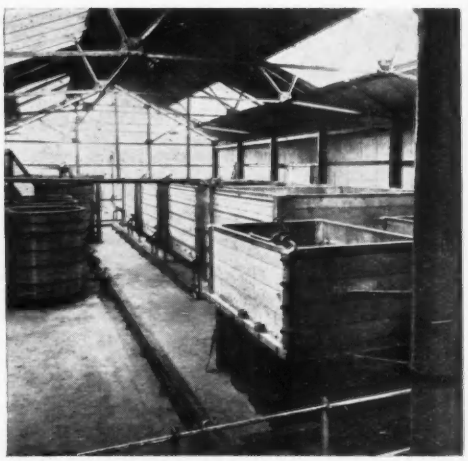




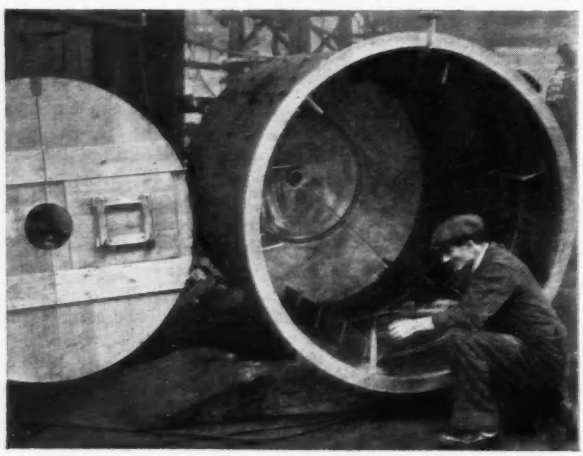
Left: A large Kestner lead acid fan erected in the works ready for test complete with the driving motor. This particular fan is capable of handling 8,000 cu. ft. per minute. The whole of the fan casing and impeller are made in lead and lead alloys. Right: An example of part finished fan cases and impellers. In the foreground will be seen a small 4 in. fan, used for draughting laboratory fume cupboards. (Kestner Evaporator and Engineering Co., Ltd.)



A twin acid cooler constructed with lead piping by John Thompson (Dudley) Ltd.



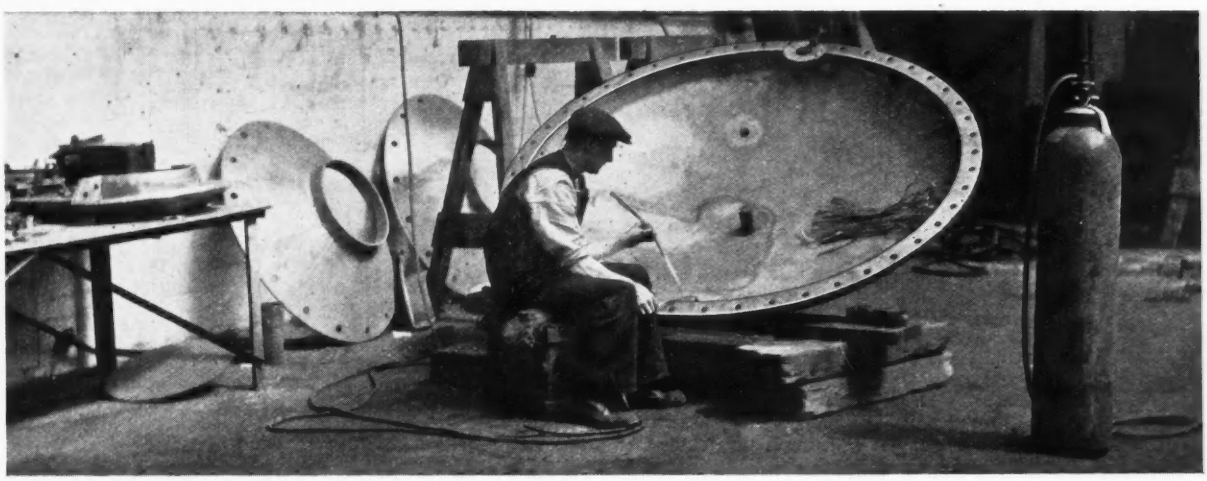
Group of lead lined timber tanks by the Kestner Evaporator and Engineering Co., Ltd.



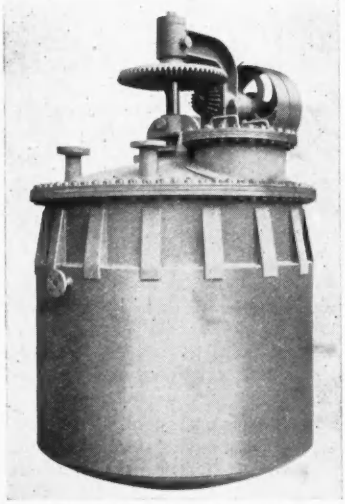
Open top vessel of mild steel in actual process of lead lining and showing baffles and coil burned on. (John Thompson (Dudley) Ltd.)

Lead priming bottles for acid pumps manufactured by Lennox Foundry Co., Ltd.

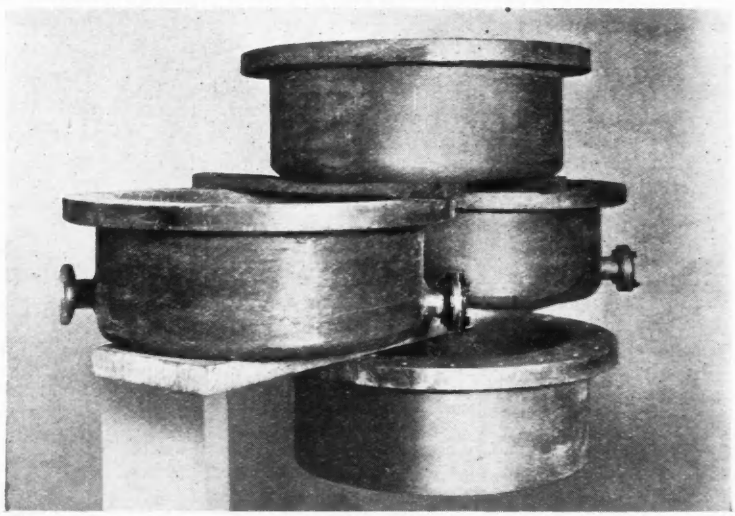
Alloys in Chemical Plant Fabrication



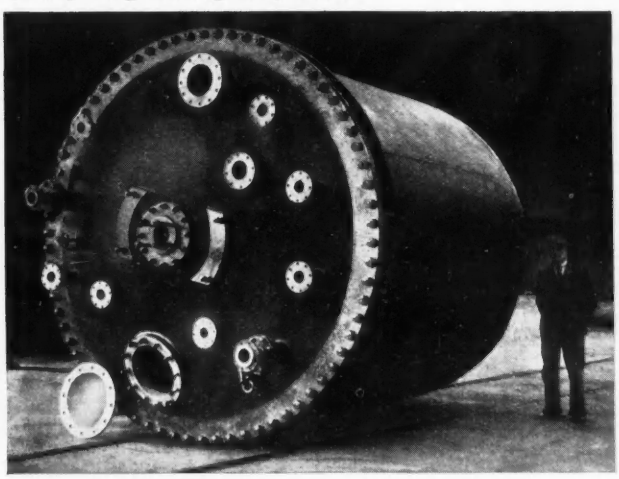
A mild steel cover, 6½ ft. in diameter, constructed by the Oxley Engineering Co., Ltd , and homogeneously lead lined at their works.



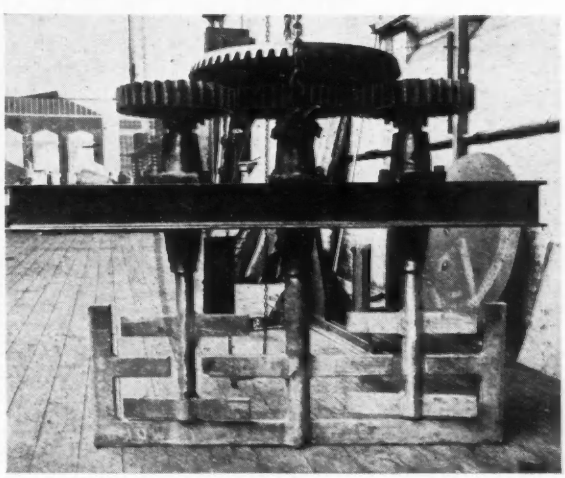
A mild steel jacketed vessel, with agitator, homogeneously lined with chemically pure lead. (Oxley Engineering Co., Ltd.)



Four cast lead saucers, of total weight sixteen tons, manufactured by Lennox Foundry Co., Ltd.



Homogeneously lead lined welded mild steel steam jacketed autoclave. (Power-Gas Corporation Ltd.)



Agitator gear with lead covered paddles for a mild steel lead lined mixer. (W. J. Fraser & Co., Ltd.)

(Continued from page 483.)

speed of tests, etc., which have an important influence. It is desirable to remember, in connection with the physical, mechanical and corrosion-resisting properties of chemical lead and lead alloys, that the tests which are evolved should have relation to the specific purpose to which the materials are eventually to be applied. Judicious correlation of physical, mechanical and corrosion-resisting tests is vital, if one is to arrive at a correct estimate of the value of the materials.

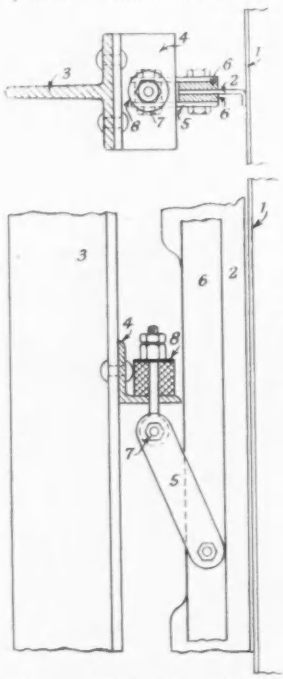
"Workability" of the lead in the hands of the chemical plumber should not be sacrificed to a slightly improved elongation value, which, after all, is not nearly so important as the former property.

Future Trends in the Use of Chemical Lead

Leaving aspects affecting the manufacture and characteristics of chemical lead and lead alloys, and coming to the construction of sulphuric acid and other chemical plants, what is significant is that intensive systems are now being almost universally adopted. Whereas hitherto 15 to 20 cubic feet of chamber space was provided for, per pound of sulphur converted to sulphuric acid per day of 24 hours, now 3 cubic feet or thereabouts of tower chamber space is regarded as adequate.

This implies that the chemical lead to-day, as used in sulphuric acid processes, is called upon to resist chemical reactions at five to six times the rate that obtained, say, 25 years ago. Yet there has been little variation in the strength of chemical lead employed. Invariably, sheet lead weighing 7 to 8 lb. per square foot is used for the construction of tower chambers to-day, just as similar poundages were used in the construction of the old rectangular chambers in 1910-1914.

But it would seem that there is little justification for the perpetuation of past practice. Thirty years ago the cost of the erection of the leadwork of sulphuric acid chambers was of the order of £1 per ton. This applied to the old form of rectangular chamber, about 20 ft. high. The sides of such chambers were usually built by unfolding two sheets on a "shutter," burning a horizontal seam, and attaching the straps. Subsequently the assembled sheets were reared on the "shutter" by block and tackle. This procedure admitted of rapid erection of the side sheets of the chamber, and there was only one vertical seam every 18 or 20 ft., dependent upon the width of the sheets used.



1. **Conical Lead Chamber.**
2. **Longitudinal lead straps.**
3. **Upright steel member of chamber framing.**
4. **Steel bracket.**
5. **Steel link.**
6. **Iron bars.**
7. **Eye bolt (adjustable)**
8. **Rubber washer.**

Fig. 1. Link (or upright) method of supporting curtains of sulphuric acid chambers (Mills-Packard).

To-day it costs about £10 per ton of lead to erect the lead work of circular tower chambers, and there is a vertical seam generally 40 to 50 ft. high, every 8 ft. 3 in.

As the leadwork of sulphuric acid chambers has to be discarded when a certain minimum poundage of lead has been reached, say something of the order of 4 lb. per square foot, it would appear logical for the patentees of such systems, or at any rate those firms who are responsible for the exploitation of these intensive systems, to recommend that heavier lead than 7 lb. or 8 lb. per square foot should be employed.

Obviously, if the tower chambers have to be dismantled when something of the order of 4 lb. per square foot has been reached, this represents, assuming 8 lb. was the original weight of the lead employed, a salvage weight of 50 per cent.

Apart from the leadwork of circular chambers costing to-day £10 per ton in respect of labour, the cutting-down of the lead, its transfer to the melting pot, its formation into pigs, despatch to the lead works and the cost of rolling an equivalent quantity of virgin pig lead, represents an additional cost of the order of £8 per ton. Thus, on every ton of lead this is dismantled, there is an expense of the order of £18 per ton.

Conditions in the sulphuric acid industry to-day demand that expenses of this kind should be carefully scrutinised. It is evident that if 10 lb. lead were used, or if 12 lb. lead were used in the construction of tower chambers, assuming such lead served for 10 years, when of 8 lb. strength, then it is logical to suppose that it would serve for 15 years if of 10 lb. strength, and 20 years if of 12 lb. strength.

Thus, the cost of erection of lead per ton/year would be:—

8 lb. strength ..... $\frac{£18\ 0s.\ 0d.}{10\ \text{years}}$ = £1 16s. 0d. per ton/year

10 lb. strength ..... $\frac{£18\ 0s.\ 0d.}{15\ \text{years}}$ = £1 4s. 0d. per ton/year

12 lb. strength ..... $\frac{£18\ 0s.\ 0d.}{20\ \text{years}}$ = 18s. 0d. per ton/year

Viewing the matter from the point of view of salvage weight in relation to the original weight of the lead, the utilisation factor would be:—

8 lb. strength − 4 lb. strength = 50.0 per cent. utilisation.
10 lb. strength − 4 lb. strength = 60.0 per cent. utilisation.
12 lb. strength − 4 lb. strength = 66.6 per cent. utilisation.

If development proceeds on the foregoing lines, it will be necessary for lead manufacturers to be in a position to deal with a heavier block of lead, because it will be imperative, in the interests of the economy of chemical plumbers' wages, and erectors, that the same size of sheets that are available to-day in 8 lb. strength lead should be at the disposal of the chemical manufacturer in 10 lb. or 12 lb. strength.

Indeed, there is need to-day for sheet lead of 10 to 12 lb. strength in lengths of 50 ft. by 12 ft. wide.

Again, the modern type of sulphate of ammonia saturator is one having a capacity of 40 to 60 tons of sulphate of ammonia per day, as contrasted with capacities of 5, 10 and at most 20 tons per day, ten years ago. Such large sulphate of ammonia saturators demand a cracker pipe having a 10 in. to 12 in. bore, by 1 in. walls, and these pipes are required in lengths of about 12 ft.

If it were possible to obtain lead pipe of the foregoing characteristics and lengths, and chemical sheet lead of the dimensions and poundage indicated, it would certainly be a distinct advantage to many of the large chemical manufacturers to-day.

The current tendency in the chemical industry is for larger units of plant. Hitherto the units have been unnecessarily small, and therefore the chemical products have been manfactured at a cost which cannot be tolerated in these days of keen competition from large competitive combined organisations.

One appreciates that to be able to roll such sheets, or to draw pipe of such bores as have been indicated, demands ex-

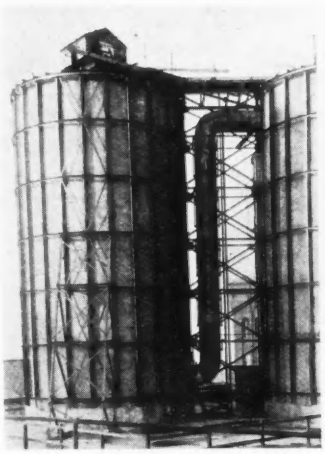


Fig. 2.

Fig. 4.

Fig. 2. Exposed Galliard-Parrish tower chamber, supported by steel framework. Fig. 3. Exposed Gaillard-Parrish tower chamber supported by pitch pine framework. Fig. 4. Method of supporting top of tower chamber by means of straps (ferrocrete framework).

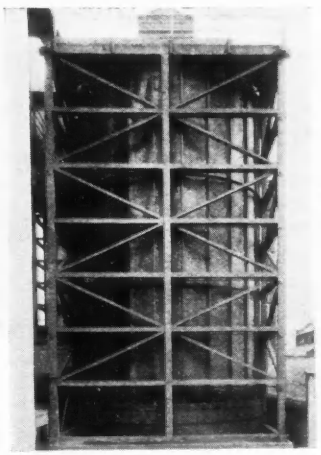


Fig. 3.

pensive plant, and the lead manufacturers would need to have some assurance that a pre-determined quantity of orders would be forthcoming for the requirements indicated, before they could lightly embark on the expenditure that would be involved.

Problems in the Construction of Sulphuric Acid Tower Chambers

There are many methods of constructing the leadwork of sulphuric acid tower chambers to-day. The Mills-Packard system calls for a tower chamber in the form of a truncated cone, and usually divided. The divided section is of D-shape. The outer shell has a slope ratio of 1 :10 (1 foot inward for every 10 feet vertical). With a view to taking up vibration due to wind, or earth pulsations, caused by the operation of large mechanical plants or mobile engines, a link method of supporting the sides of the tower chambers has been developed. This is shown in Fig. 1, and is covered by patents. It is largely self-explanatory. Resiliency is obtained by a thick rubber washer, through which the eye-bolt attached to the link is passed.

The Mills-Packard system appears to be limited in form to a tower chamber of the truncated cone type, erected as a whole or as a divided chamber.

On the contrary, the Gaillard-Parrish system can be erected in the form of circular, square, hexagonal or octagonal tower chambers, and either form is equally applicable to the dispersion of cooled acid, and all that the liquid phase system implies. Indeed, it is possible to erect the last three forms at a cost of about £5-£6 per ton of leadwork, whereas with the circular form, such as it shown in Figs. 2 and 3, the cost of the erection of the leadwork, with trunks, which are peculiarly attractive and neat, as can be seen from Fig. 2, is of the order of £10 per ton.

Moreover, the skeleton framework supporting the lead, in the case of either of the four forms of Gaillard-Parrish tower chambers, can be either of steelwork (see Fig. 2), or of pitch pine (see Fig. 3), or of ferro-concrete (see Fig. 4).

Fig. 2 represents an exposed tower chamber of the Gaillard-Parrish type, 22 ft. 6 in. diameter by 42 ft. 6 in. high. The lead shell is supported by continuous vertical lead wings, placed at 2 ft. 3 in. centres, bolted between a flat and angle at 8 in. centres.

Fig. 3 shows the shell of another form of Gaillard-Parrish tower chamber, suspended from a top "Z" ring, to which the depending vertical angles are attached via stirrups. In this case the vertical angles are at centres of 2 ft. 3 in. Light circumferential angles are used to give rigidity to the suspension. As the whole structure floats from the top, provision is normally made for elongation due (a) to the weight of the lead shell itself, and (b) to temperature. The framework can be partially boarded on the four outer sides, in order to reduce vibration due to wind, and still ensure upward cooling currents against the lead walls.

Fig. 4 shows one method of supporting the tops of the tower chambers by means of a strap, held in position over rolled steel joists. It also reveals how a suitable house can be afforded, which lends easy access for the feed of acid to the dispersers, three of which are seen centrally placed in the tops of the tower chambers.

The problems with which the chemical engineer is faced in the construction of the leadwork of sulphuric acid chambers are (a) elongation of the side sheets, due to their own weight; (b) elongation due to temperature changes, caused by the reactions within the tower chambers; (c) alternating stresses due to variations of temperature; and (d) vibrations due to wind and/or terrestrial pulsations.

Factor (a) can be largely legislated for in the erection of the leadwork by allowing the side sheets to hang from the top until the elongation due to their weight has become more or less stationary. Factor (b) can be partially provided for by the use of continuous vertical straps, in which a spring or rubber method of attachment is furnished, on the lines of what is represented in Fig. 1. Factor (c) is not so easily provided for, inasmuch as the stresses can be in various directions. Factor (d) is at least partially legislated for by having a resilient form of attachment.

The use of stronger lead, such as has been envisaged, may afford means for circumventing substantially the adverse influences attributable to the four factors indicated, and it would certainly be advantageous from a corrosion-resisting viewpoint.

Other Current Tendencies

To-day some Government factories are using heavy chemical lead for the storage of cold nitric acid, 60-70 per cent. HNO_3, and lead is being used as a cover, suitably protected, for nitric acid absorption towers.

The lead-lining of the bodies of saturators is being effected autogenously—a rigid attachment being effected by the use of a suitabe flux to the steel shell.

On the other hand, steel shells are being lead-lined with 20 lb. lead, and protected with suitable acid and heat-resisting bricks.

The uses to which chemical lead and lead alloys can be applied, appear to be increasing daily, although there are always competitive materials, which have to be considered, and might conceivably be used. On balance, chemical lead and lead alloys are still the subject of brisk demand.

Personal Notes

MR. A. C. CUMMING has resigned his office as a director of the United Molasses Co., Ltd., as from June 8.

MR. WILLIAM STEWART, secretary of Stewarts and Lloyds, Ltd., has been appointed a director of the company.

THE LATE MR. REES JENKINS, of Sheffield, chemical engineer, left estate valued £58,642, with net personalty £29,894.

SIR WILLIAM BRAGG, director of the Royal Society, has been unanimously elected an associate member of the Académie des Sciences, Paris.

MR. H. V. POTTER, B.Sc., F.I.C., M.I.Chem.E., managing director of Bakelite, Ltd., has been nominated vice-president of the Society of Chemical Industry. The nomination is subject to confirmation at the annual meeting to be held at Ottawa next week. Mr. Potter is now in the United States on business and will attend the meeting.

DR. F. W. HAYWOOD, Ph.D. (Lond.), B.Sc (Hons) Lond., A.I.C., has been appointed chief metallurgist to Wild-Barfield Electric Furnaces, Ltd., to take charge of the new research department nearing completion. Dr. Haywood, who is at present engaged with I.C.I. (Fertiliser and Synthetic Products), Ltd., at Billingham, will be commencing his duties later in the year.

SIR JAMES IRVINE, Principal of St. Andrew's University, returned to Scotland from America on June 10. He has been acting as one of two British representatives on the occasion of the dedication by President Roosevelt of the new wing of the Franklin Institute, Philadelphia. On June 22 he will go to Oxford to receive the honorary degree of D.C.L.—his thirteenth honorary degree.

PROFESSOR JAMES IRVINE MASSON, who has been professor of chemistry and head of the department of pure science at Durham University since 1924, has been unanimously elected to the Vice-Chancellorship of Sheffield University, which will be vacated shortly by Dr. A. W. Pickard-Cambridge. Professor Masson, who was born in 1887, is a son of the late Sir David Orme Masson, Vice-Chancellor of Melbourne University.

OBITUARY

SIR ARTHUR SPURGEON, who was a member of the Royal Commission on Paper and Papermaking in 1917, died at his home at Woldingham, Surrey, on June 9, at the age of 77.

MAJOR THOMAS GREGORIE TULLOCH, one of the promoters and a director of Palestine Potash, Ltd., has died suddenly in Palestine, at the age of 72. In 1929, together with Mr. Novomeysky, he was granted a concession to extract mineral salts from the Dead Sea, and the above-named company was formed to develop the concession and extract potash salts and bromine. Major Tulloch was formerly A.D.C. to the Viceroy of India. Prior to the war he was associated with the Chilworth Gunpowder Co., and it was at Chilworth that a small works was built for the manufacture of the explosive T.N.T. for the first time in England.

MR. HENRY JOHNSON, former managing direector of Courtaulds, Ltd., and one of the pioneers of the rayon industry, both in England and in America, died in a nursing home at Coventry on June 13, at the age of 72. Mr. Johnson joined Courtaulds at the company's original factory at Braintree, Essex, in 1895. He assisted in starting the manufacture of artificial silk at Coventry as early at 1904. In 1910 he went to America and assisted in founding a similar factory at Markus Hook, Pennsylvania, which was the beginning of the America Viscose Corporation. Mr. Johnson retired from the position of managing director of Courtaulds two years ago, and was then succeeded by his eldest son, Mr. Henry Leslie Johnson.

MR. JAMES M'PHERSON, formerly associated with the Calico Printers' Association, died at Glasgow, on June 9, at the age of 83.

MR. WILLIAM SCOTT, chief analytical chemist at the Tradeston station of the Glasgow Corporation Gas Department, has died suddenly.

Ten Years Back

From "The Chemical Age," June 16, 1928

PROFESSOR R. LEPETIT, the Italian chemist died on March 27, aged 62. He worked out two synthesis of indigo, a synthesis of phenyl-glycine, the well-known bisulphite method for the preparation of 1-naphthol-4-sulphonic acid, the production of the pigment "Italian Green," etc. He was president of the Societa di Chimica Industriale.

* * * *

The first unit for Continuous Coal Carbonisation, Ltd., capable of carbonising 50 to 60 tons of coal per day, and forming part of the complete plant to carbonise 1,000 tons daily, is being installed at Erith. The directors anticipate that this unit, together with the complete condensing and distillation plant for dealing with by-products, will be in operation by the contract date at the end of July.

* * * *

In a review of world economic conditions in 1927, Mr. Alberto Pirelli, president of the International Chamber of Commerce, states that the world production of superphosphates increased by 15 per cent.; that of nitrate, dyestuffs, caustic soda and sodium carbonate showed a decrease, and that of potash a still more marked decrease. The world production of nitrate is estimated as follows: Synthetic nitrate, 840,000 tons (60 per cent. of the total); coke oven nitrate, 310,000 tons (22.1 per cent.); Chilean nitrate, 250,000 tons (17.9 per cent.). The output of potash in the two principal producing countries was estimated as, Germany 1,240,000 tons, and France 372,000 tons.

Foreign Chemical Notes

Japan

BEAN CAKE IS UTILISED in making a product resembling synthetic resin or ebonite by a process discovered at the agricultural institute of the University of Kyoto.

Germany

STABLE FIBRE IS TO BE MANUFACTURED in Austria by the newly-formed Zellwolle Lenzing A.G., capital 1 million marks.

France

ETABLISSEMENTS KUHLMANN in their report for 1937 disclose a net profit of 34 million francs. Taking into consideration the franc devaluation in that year, this is a setback from the 1936 figure of 29 millions. The dividend of 25 francs per share compares with 20 francs in the previous year.

Sweden

CONSTRUCTION OF A PETROLEUM REFINERY at Nynashamm is planned by a Stockholm shipbuilding concern which is applying for a state loan of 6 million kronen to finance the undertaking.

THE NEW GASMASK FACTORY at Brastad will commence production in August with a daily output of 1,000 masks. Government contracts already received will keep the factory fully occupied for 2½ years.

From Week to Week

THE AMERICO-IRANIAN OIL CO. has renounced the monopoly granted to it in 1936 by the Government of Iran.

THE CHEMICAL CLUB, 2 Whitehall Court, London, S.W.1, has changed its telephone number from Whitehall 3160 to Abbey 5462.

A SPECIFICATION FOR A SPECTROCHEMICAL LABORATORY for the routine quantitative spectrographic analysis of metals and alloys, has been published by Adam Hilger, Ltd.

WALTON CHEMICAL CO., LTD., of Bull Lane, Aintree, Liverpool, has increased its nominal capital by the addition of £5,000 in £1 ordinary shares, beyond the registered capital of £5,000.

A SYNTHETIC LINING AND COATING which can be applied easily to any metal and gives a hard, glass-like, non-chipping, flexible, acid-proof surface, is now being supplied by Newton, Chambers and Co., Ltd. It was originally developed for lining tanks, and is known at Lithcote.

CROW, CATCHPOLE AND CO., LTD., tar distillers and tarmacadam manufacturers, are changing the address of their head office from Aldwych House to 25-28 Buckingham Gate, London, S.W.1, as from June 20. The new telephone number will be Victoria 6877 (9 lines). Telegrams: "Crowsnest, Phone, London."

SILHOUETTE PHOTOGRAPHS OF HANGING DROPS OF LIQUID, taken with a special camera, are being used at Massachusetts Institute of Technology to determine the surface tensions of solutions, according to a paper read by John M. Andreas and W. B. Tucker before the 15th National Colloid Symposium of the American Chemical Society.

DESPITE NOTABLE DEVELOPMENTS in the production of high-strength aluminium alloy castings, there is still a tendency to associate the materials with tensile strengths approaching only 10 tons per square inch. For this reason the Aluminium Information Bureau has published a table showing the available range of aluminium casting alloys supplied to various specifications.

MEMBERS OF THE INTERNATIONAL CONFERENCE of the Institution of Petroleum Technologists were the guests of Shell Oils, Ltd., on June 8, when they inspected the Burngrange and Westwood pits, in the Lothian shale area, the Deans oil works where the shale is distilled, and the refinery at Pumpherston, where crude oil is converted into motor spirit, solvent naphtha, diesel oil and paraffin wax.

ONE HUNDRED AND TWENTY DELEGATES from all parts of the United Kingdom gathered at Torquay for the annual summer convention of the National Federation of Associated Paint, Colour and Varnish Manufacturers this week. The delegates were officially received by the president, Mr. A. Ll. Matthison, and were accorded a civic welcome to Torquay by the Deputy Mayor, Col. Rowland Ward.

THE INFLUENCE OF TANTALUM and niobium on iron and steel is the subject of an article illustrated with 11 photo-micrographs and 3 graphs of unusual interest, published in the April issue of *Sands, Clays and Minerals*. There is also a useful article on the mode of occurrence and preparation of china clays with particular reference to deposits in Cornwall, and one on the selection of coal for industrial purposes, briefly explaining and specifying types of coal for each particular industry.

SOLEDON BRILLIANT GREEN 5GS POWDER, an addition to the I.C.I. range of Soledon colours, gives brilliant yellowish hues which will be found particularly attractive for the production of pale to medium shades on a variety of materials. Owing to the fact that no reduction process is required for its application, Soledon Brilliant Green 5GS is specially recommended for the production of pale coloured grounds on materials such as shirting or towelling fabrics containing vat or azoic dyed effects, threads or woven stripes.

THE NEW (JUNE) EDITION of the B.D.H. catalogue of laboratory chemicals includes the following products for the first time: Barium periodate, benzyl methyl ketone, butyrylcholine chloride, cadmium borate, n-caproyl chloride, cetyl bromide, dibenzyl ketone, 2:5 diethoxy-aniline, *p*-diethoxybenzene, ethyl crotonate, haematin hydrochloride (haemin), indophenol, lauryl chloride, lead tungstate, magnesium perchlorate (hydrated), magnesium thiocyanate, mercapto-benzothiazole, mercury diphenyl, mercury potassium iodide (soluble), nicotinic acid, nicotinic acid amide (nicotinamide), 3-nitrophthalic anhydride, nitroso-dimethylamine, oxalyl chloride, pentamethylene bromde, pepsin crystalline, petroleum ether conforming to I.P.T. specification for sludge test, phenol-tetrachlorophthalein (biologically tested), phenyl-arsonic acid, β-phenylisopropylamine, potassium selenate, iso-propyl propionate, protamine sulphate (from salmon milt), quinaldine ethyl iodide, selenium monobromide, sodium sulphanilyl-sulphanilate, tetrachloro-phthalic anhydride, trichloro-ethylene purified for medicinal use, umbelliferone, urease from water melon seeds, vitamin B_1 crystalline (aneurin), and vitamin B_2 crystalline (lactoflavine).

THE INSTITUTE OF PHYSICS has elected the following new Fellows: M. A. Cooper, G. H. Godfrey, M. A. Haque, R. V. Jones, B. Thomas.

IMPERIAL CHEMICAL INDUSTRIES, LTD., has given £5,000 towards the cost of a new chemistry department which is to be erected at Aberdeen University.

A GUIDE TO THE CONSTRUCTION, operation and principal advantages of the Drayton Armstrong steam trap has been published by The Drayton Regulator and Instrument Co., Ltd.

THE LINOLEUM FACTORY of Miles, Sykes and Son, at Northallerton, closed down officially last week. There is the possibility that in the future it will be used as a munitions or aircraft works.

AN EXPLOSION OCCURRED at the British Light Metal Company's works in Bridlepath, Beddington, Surrey, on June 13. The explosion was in a room where magnesium powder was being used. Part of the roof was blown off and a section of wall was knocked down.

J. C. AND J. FIELD, manufacturers of soap, candles, etc., announce the intention of the board in future to declare an interim dividend on the ordinary shares at the same date as the interim on the preference. The preference dividend is paid in December.

SALES BY THE POTASH SYNDICATE OF GERMANY in the first three months of the current year amounted to (paper) £903,338, reports J. Henry Schröder and Co. Proceeds of sales for the remaining nine months of the year were estimated at £3,094,000, making £3,997,338 in all.

THE NETHERTON WORKS OF THE IOCO RUBBER AND WATERPROOFING CO., LTD., at Anniesland, Glasgow, were practically gutted by fire on Tuesday, damage being estimated at several thousand pounds. The flames were prevented from spreading to an adjoining shed where gun-cotton was stored.

THE BOOTLE FIRE BRIGADE was summoned when a pot of molten gum caught fire in the varnish-house at the works of the Sanitary Paint Co., Ltd., Rimrose Road, Bootle, on June 13. The flames were prevented from damaging a fume extractor plant, but in attempting to put the pot on to a trolley with the object of removing it from the building, Eric Williams (22), of Rosebery Avenue, Waterloo, was burned about the face.

STEEL OUTPUT DURING MAY, at 957,000 tons, shows a slight increase over the April total of 938,600 tons, but a fall in the daily rate from 39,000 tons to 35,400 tons. In May, 1937, the production was 1,047,300 tons and the daily rate 43,600 tons. While the daily output was lower, steel production, the British Iron and Steel Federation states, represented operations at approximately 81 per cent. of maximum capacity, allowance being made for the withdrawal of a number of the older furnaces which have fulfilled peak service.

IN A REPORT TO LEVER BROTHERS AND UNILEVER, LTD., Capt. John Walter, chief engineer of the firm's mechanical transport department, refers to the use of oils extracted from the palm, soya bean, cotton seed and ground nut. He states that any of these vegetable oils are an alternative fuel, which will be quite satisfactory in normal operation, to the standard gas oil supplied by the petroleum companies. He sees a future for vegetable oils as fuel generally in about 10 years' time, when the Diesel engine is in more general use.

THE WORLD COAL OUTPUT, including lignite, during the past year totalled 1,500,000,000 tons, or 91,000,000 tons more than in 1936 according to the Reich Coal Council. The record productions figure of 1929 was still 15,000,000 tons above that of last year. Europe's share in the output amounted to 50.9 per cent. (against 49.7 per cent. in 1936), being 1.3 per cent. more than in pre-war years. America's share dropped from 37.1 per cent. in 1936 to 35.7 per cent., or 8.1 per cent., below the pre-war figures. The world's coal output alone was about 1,250,000,000 tons and the lignite output 253,700,000 tons.

THE SECRETARY FOR MINES announces that he has appointed a committee to inquire into the organisation and methods of distribution of coal, coke and manufactured fuel; to investigate the various items which make up the differences between the prices received by the producers and those paid by the consumers and to make recommendations. The committee is constituted as follows: Sir Walter Monckton (chairman), Professor J. H. Clapham, Sir Herbert Hiles, Mr. H. Lancelot H. Hill, Miss E. T. Kelly, Sir John Lorne MacLeod, Major E. G. Mouro, Mr. R. J. Moffat, M.B.E., of the Mines Department, is the secretary of the Committee.

Books Received

An Introduction to Chemistry. By John Arrend Timm. Third Edition. London: McGraw-Hill Publishing Co., Ltd. Pp. 568. 21s.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

MANUFACTURE OF BARIUM COMPOUNDS.—A. G. Allen (Stockton), Ltd., and D. Tyrer. 16382.

PROCESSES FOR THE DE-SULPHURISATION OF IRON, ETC.—E. F. O. Altenhein. 16128.

MANUFACTURE OF AMMONIUM SULPHATE.—J. Bell, and Imperial Chemical Industries, Ltd. 16147.

RECOVERY OF NITROGEN OXIDES from nitric acid liquors, etc.—J. Bell, and Imperial Chemical Industries, Ltd. 16313.

REMOVAL OF CARBONIC OXIDE from gases or mixtures of gases containing organic sulphur compounds.—R. Brandt. 15890.

DISTILLATION OR HEAT TREATMENT OF SOLID CARBONACEOUS MATERIALS.—British Coal Distillation, Ltd., and E. H. G. Aram. 16293.

DISTILLATION OR HEAT TREATMENT OF SOLID CARBONACEOUS MATERIALS.—British Coal Distillation, Ltd., W. A. Chamberlain, and E. H. G. Aram. 16295.

DISTILLATION OR HEAT TREATMENT OF SOLID CARBONACEOUS MATERIALS.—British Coal Distillation, Ltd., C. Machen, and E. H. G. Aram. 16294.

MANUFACTURE OF LEUCO ESTERS OF VATTABLE COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) 15937.

PROCESS FOR THE RECOVERY OF CALCIUM SALTS in the manufacture of paper pulp.—T. Cay. 16027.

MANUFACTURE OF ALKALI PHOSPHATES.—Chemische Fabrik Budenheim, A.-G. (Germany, July 15, '37.) 15804.

ANTHRAQUINONE COMPOUNDS.—S. Coffey, N. H. Haddock, C. Wood, and Imperial Chemical Industries, Ltd. 15819.

MANUFACTURE OF UNSATURATED DERIVATIVES from chlorinated hydrocarbons of high molecular weight.—J. W. C. Crawford. 16144.

REMOVAL OF BISMUTH from bismuth-containing lead.—F. Cuvelliez, and Soc. Générale Metallurgique de Hoboken. 15854.

MANUFACTURE OF QUATERNARY AMMONIUM COMPOUNDS.—Deutsche Hydrierwerke, A.-G. (Germany, May 27, '37.) 15909.

CATALYTIC DEHYDROGENATION REACTIONS.—Distillers Co., Ltd., and H. M. Stanley. 16423.

PRODUCTION OF COMPOSITE TITANIUM PIGMENTS.—E. I. du Pont de Nemours and Co. (United States, May 27, '37.) 15727.

PRODUCTION OF CALCIUM SULPHATE.—E. I. du Pont de Nemours and Co. (United States, May 27, '37.) 15728.

MANUFACTURE OF AROMATIC NITRILES.—E. I. du Pont de Nemours and Co. (United States, May 29, '37.) 15947.

ELECTRODEPOSITION OF ZINC.—E. I. du Pont de Nemours and Co., L. R. Westbrook, and R. O. Hull. 15820.

PREPARATION OF IMIDINES, ETC.—H. D. Elkington (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). 16422.

MANUFACTURE OF TERPHENYL DERIVATIVES.—H. France, I. M. Heilbron, D. H. Hey, and Imperial Chemical Industries, Ltd. 16145.

PRODUCTION OF WATER-SOLUBLE COMPOUNDS of the aromatic series.—J. R. Geigy. (Switzerland, May 29, '37.) 15927.

MANUFACTURE OF SALT-LIKE COMPOUNDS with co-ordinative tetravalent nitrogen.—W. W. Groves (I. G. Farbenindustrie.) 15883.

MANUFACTURE OF DERIVATIVES OF PYRIDINE-6-CARBOXYLIC ACID.—F. Hoffman-La Roche and Co., A.-G. (Germany, Aug. 25, '37.) 15693.

MANUFACTURE OF LAMINATED RESIN IMPREGNATED MOULDINGS.—H. W. Hutton, and G. R. Eyssen. 16268.

MANUFACTURE OF RESIN IMPREGNATED MOULDING MATERIALS and mouldings therefrom.—H. W. Hutton, and G. R. Eyssen. 16269.

MANUFACTURE OF AROMATIC COMPOUNDS alkylated in the nucleus.—I. G. Farbenindustrie. (Germany, June 23, '36.) 15885.

TREATMENT OF OITICICA OIL.—G. W. Johnson (I. G. Farbenindustrie.) 15757.

MANUFACTURE, ETC., OF NITROGENOUS CONDENSATION PRODUCTS. G. W. Johnson (I. G. Farbenindustrie.) 15758.

MEANS FOR RENDERING FIBROUS MATERIALS WATER-REPELLENT.—G. W. Johnson (I. G. Farbenindustrie.) 15759.

PRODUCTION OF WROUGHT IRON GOODS of high-percentage magnesium alloys.—Magnesium Elektron, Ltd. (Germany, June 7, '37.) 15996.

PROCESS FOR WASHING OUT HYDROCARBONS FROM GASES.—Metallges, A.-G. (Germany, June 16, '37.) 15803.

MANUFACTURE OF AN ALDOL CONDENSATION PRODUCT from carbonyl compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, June 12, '37.) 16292.

MANUFACTURE OF AMMONIUM SULPHATE.—G. Ogden, and Imperial Chemical Industries, Ltd. 16146.

TREATMENT OF WASTE ACIDS containing nitric acid.—H. Pauling. 16257.

UREA DERIVATIVES.—H. A. Piggott, J. D. Rose, and Imperial Chemical Industries, Ltd. 15948.

QUATERNARY AMMONIUM COMPOUNDS.—H. A. Piggott, J. D. Rose, and Imperial Chemical Industries, Ltd. 15949.

PREPARATION OF A MATERIAL containing luminescent zinc sulphide, etc.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. (Germany, June 4, '37.) 16415.

SEPARATION OF GOLD, ETC., from ores.—B. W. Ramsey, and R. A. White. 16310.

MANUFACTURE OF SOAP.—Refining, Inc. (United States, May 28, '37.) 15870.

MANUFACTURE OF THERAPEUTICALLY VALUABLE SULPHO COMPOUNDS.—Schering, A.-G. (Germany, June 1, '37.) 16286; (Germany, Aug. 20, '37.) 16287.

CERAMIC PROCESSES.—F. Singer. 15829.

MANUFACTURE OF COMPOUNDS of the cyclo-pentano-polyhydrophenanthrene series.—Soc. of Chemical Industry in Basle. (Holland, May 29, '37.) 16116.

MANUFACTURE OF ARYLIDES or ortho-oxycarboxylic acids and dyestuffs.—Soc. of Chemical Industry in Basle. (Switzerland, June 2, '37.) 16240; (Switzerland, March 26.) 16241.

MANUFACTURE OF CATALYSTS for cracking petroleum oils.—Standard Oil Development Co. (United States, Sept. 29, '37.) 15749.

MANUFACTURE OF RESINS.—Standard Oil Development Co. (United States, Oct. 6, '37.) 15872.

PRODUCTION OF METALLIC MAGNESIUM.—H. Suzuki. 15920.

MANUFACTURE OF ANTI-KNOCK MOTOR FUEL HYDROCARBONS.—Texaco Development Corporation. (United States, June 25, '37.) 16091.

ALKYLATION OF HYDROCARBONS.—Texaco Development Corporation. (United States, June 18, '37.) 16092.

TREATMENT OF HYDROCARBON OIL.—Texaco Development Corporation. (United States, June 18, '37.) 16379.

MANUFACTURE OF HIGHLY DISPERSED LEAD OXIDES.—A. Wreschner. 16316.

Specifications Open to Public Inspection

COATING OF SURFACES of zinc or zinc alloys.—American Chemical Paint Co. Nov. 30, 1936. 29730/37.

HYDRATION OF OLEFINES.—Carbide and Carbon Chemicals Corporation. Nov. 25, 1936. 29566/37.

PREPARATION OF AROMATIC ISOTHIOCYANATES.—S. Goldschmidt, and K. Martin. Nov. 24, 1936. 30007/37.

REGENERATION OF A HYDROXYL EXCHANGE MATERIAL suitable for purifying water.—I. G. Farbenindustrie. Nov. 24, 1936. 30368/37.

METHOD OF AND APPARATUS FOR CARRYING OUT CHEMICAL REACTIONS.—B. Berghaus. Nov. 28, 1936. 31545/37.

ANODIC TREATMENT OF MAGNESIUM and its alloys.—R. W. Buzzard. Nov. 27, 1936. 32193/37.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. Nov. 26, 1936. 32404/37.

PROCESS FOR THE MANUFACTURE OF THIOACETAL-SULPHONIC ACIDS. J. R. Geigy, A.-G. Nov. 25, 1936. 32517/37.

CATALYTIC PRODUCTION OF HYDROCARBONS.—Metallges, A. G. 32983/37.

PROCESS FOR THE PYROLYTIC CONVERSION OF HYDROCARBON OILS. Universal Oil Products Co. Nov. 30, 1936. 33129/37.

MANUFACTURE OF AROMATIC COMPOUNDS alkylated in the nucleus.—I. G. Farbenindustrie. June 23, 1936. 15885/37.

ZINC ALLOYS.—G. von Giesche's Erben (firm of). Dec. 4, 1936. 18497/37.

PROCESS OF MAKING SOLUTIONS of cellulose and cellulose compounds.—Cellulose Holdings, Ltd. Dec. 4, 1936. 30132/37.

MANUFACTURE OF CERAMIC PRODUCTS especially of ignition plug insulators.—R. Bosch, A.-G. Dec. 1, 1936. 30528/37.

PROCESS FOR OBTAINING ORGANIC COMPOUNDS from the acid wastes from refining of mineral oils.—J. Winkler, W. J. Piotrowski, and Galicysjskie Towarzystwo Naftowe Galicja Soc. Anon. Dec. 2, 1936. 31052/37.

METHOD AND APPARATUS FOR THE ALLOYING OF METALS.—Okonite-Callender Cable Co., Inc. Dec. 5, 1936. 32917/37.

PROCESS AND APPARATUS FOR IMPROVING THE POUR POINT OF HYDROCARBON MIXTURES containing wax.—H. G. Tovote. Dec. 1, 1936. 33011/37.

RESINOUS COMPOSITIONS and methods of making the same.—British Thomson-Houston Co., Ltd. Dec. 4, 1936. 33073/37.

MANUFACTURE OF POLYMERISABLE OILS.—E. I. du Pont de Nemours and Co. Dec. 1, 1936. 33269/37.

PROCESS FOR THE CATALYTIC PRODUCTION OF HYDROCARBONS.—Metallges, A.-G. Dec. 2, 1936. 33360/37.

REMOVAL OF CARBONIC ACID FROM GAS by washing.—O. Bormann. Dec. 5, 1936. 33401/37.

MANUFACTURE OF VINYL POLYMERISATION PRODUCTS.—Chemische Forschungsges. Dec. 4, 1936. 33516/37.

PROCESS FOR THE MANUFACTURE OF NEW VAT DYESTUFFS.—I. G. Farbenindustrie. Dec. 3, 1936. 33538/37.

MANUFACTURE OF CAST RESINOUS ARTICLES containing metal parts.—British Thomson-Houston Co., Ltd. Dec. 5, 1936. 33722/37.

Specifications Accepted with Dates of Application

MANUFACTURE OF STEEL.—Rochling'sche Eisen-Und Stahlwerke Ges. (Sept. 12, 1935. 485,881.

MANUFACTURE AND APPLICATION OF POLYMERISATION PRODUCTS. B. J. Habgood, and R. Hill, L. B. Morgan and Imperial Chemical Industries, Ltd. Aug. 25, 1936. 485,941.

DYEING CELLULOSE.—A. Carpmael (I. G. Farbenindustrie.) Aug. 26, 1936. (Samples furnished.) 485,920.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. Nov. 24, 1936. 485,757.

MANUFACTURE OF ISOCYANATES.—H. A. Piggott, F. S. Statham, and Imperial Chemical Industries, Ltd. Nov. 24, 1936. 485,761.

MANUFACTURE OF ALKALI METAL CYANIDES.—L. J. Burrage, and Imperial Chemical Industries, Ltd. Nov. 24, 1936. 485,762.

MANUFACTURE OF CYCLIC ACETALS of formaldehyde.—W. W. Groves (I. G. Farbenindustrie.) Nov. 27, 1936. 486,015.

PRODUCTION OF DISPERSIONS OF SOLID CARBONACEOUS MATTER IN OIL.—W. W. Groves (I. G. Farbenindustrie.) Nov. 27, 1936. 486,088.

MANUFACTURE AND PRODUCTION OF BUTADIENE.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 30, 1936. 486,094.

MANUFACTURE AND PRODUCTION OF DERIVATIVES OF PYRENE.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 30, 1936. 485,874.

PROCESS FOR THE MANUFACTURE OF WATER-SOLUBLE AZO-DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) Nov. 30, 1936. 486,097.

MANUFACTURE AND PRODUCTION OF CONDENSATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) Jan. 7, 1937. 485,883.

VACUUM TIGHT SEALING OF TUNGSTEN or molybdenum conductors through quartz glass or glasses of high silica content.—General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Gluhlampen). Feb. 12, 1937. 485,786.

TREATMENT OF MATERIALS containing tantalum and/or niobium. W. W. Triggs (Soc. Generale Metallurgique de Hoboken). March 19, 1937. 485,797.

CONCENTRATED CASEIN SOLUTIONS having an acid reaction.—E. Schueller. April 16, 1937. 485,805.

RECOVERY OF SULPHUR DIOXIDE from gases containing same.—Metallges, A.-G. June 23, 1936. 485,955.

OBTAINING BERYLLIUM FLUORIDE free from oxide.—Seri Holding Soc. Anon. July 15, 1936. 485,711.

MANUFACTURE OF INDIGOID VAT DYESTUFFS.—Soc. of Chemical Industry in Basle. June 26, 1936. 485,964.

MANUFACTURE OF SULPHONIC ACIDS of the naphthalene series. J. R. Geigy, A.-G. Sept. 11, 1936. 485,971.

MORPHOLINE EMULSIFYING AGENTS.—Carbide and Carbon Chemicals Corporation. Oct. 22, 1936. 485,723.

PRODUCTION OF LIQUEFIED CHLORINE by compression of chlorine gas and apparatus therefor.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 10, 1937. 485,838.

PROCESS FOR THE MANUFACTURE OF THROMBIN.—H. Dyckerhoff. Dec. 5, 1936. 485,731.

SHEATHED ELECTRODE for arc welding aluminium and aluminium alloys.—W. W. Triggs (Vereinigte Aluminium-Werke, A.-G.). Dec. 4, 1936. 485,741.

PREPARING PRODUCTS FROM C, C-DISUBSTITUTED BARBITURIC acids and 1,-phenyl-2, 3-dimethyl-4-dimethylamino-5-pyrazolone capable of being formed into tablets.—M. Woelm, and A. Mehle. Dec. 24, 1937. 485,742.

PROCESS FOR THE MANUFACTURE OF SULPHONIC ACID AMIDE COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) Aug. 29, 1936. 486,421.

VULCANISATION OF RUBBER.—Wingfoot Corporation. Oct. 12, 1935. 486,109.

MONOAZO DYESTUFFS.—A. H. Knight, and Imperial Chemical Industries, Ltd. Nov. 30, 1936. 486,302.

DISTILLATION OF GLYCERIN and the distillation and purification of other volatile substances.—Colgate-Palmolive-Peet Co. Dec. 23, 1935. 486,311.

HARDENING COPPER and copper alloys.—C. H. Coleman. Dec. 2, 1936. 486,121.

PREPARATION OF THERAPEUTICALLY-ACTIVE DIAMINES.—May and Baker, Ltd., A. J. Ewins, and G. Newbery. Dec. 2, 1936. 486,449.

MANUFACTURE AND PRODUCTION OF ALKYL CHLORIDES.—G. W. Johnson (I. G. Farbenindustrie.) Dec. 8, 1936. 486,453.

MANUFACTURE AND PRODUCTION OF SYNTHETIC RESINS.—G. W. Johnson (I. G. Farbenindustrie.) Dec. 16, 1936. 486,127.

PROCESS FOR THE MANUFACTURE OF UNSATURATED DERIVATIVES OF COMPOUNDS of the cyclopentano polyhydro phenanthrene series.—Schering-Kahlbaum, A.-G. Dec. 24, 1935. (Samples furnished.) 486,322.

OXIDATION OF CHROMIUM SULPHATE to chromic acid.—G. W. Johnson (I. G. Farbenindustrie.) Feb. 26, 1937. 486,153.

PRODUCING FATTY ACIDS of vegetable or animal fats or oils from their glycerides.—Albert Products, Ltd. April 22, 1936. 486,341.

METHOD OF PRODUCING VITREOUS, TRANSLUCENT, NON-POROUS SILICA ARTICLES and articles produced thereby.—J. A. Heany. March 16, 1937. 486,158.

MANUFACTURE AND PRODUCTION OF ALKALI CELLULOSE.—Courtaulds, Ltd., and E. A. Morton. March 31, 1937. 486,242.

PRODUCTION OF ALUMINIUM OXIDE from bauxite and like aluminium-containing substances.—R. Scholder. May 11, 1936. 486,255.

ALKYLATION OF PARAFFIN HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). May 26, 1937. 486,355.

PROCESS FOR THE MANUFACTURE OF COMPLEX GOLD COMPOUNDS of albumose-like keratin degradation products containing sulphydryl groups.—Schering-Kahlbaum, A.-G. June 12, 1926. 486,259.

Chemical and Allied Stocks and Shares

ALTHOUGH the industrial and other sections of the Stock Exchange were fairly steady, the tendency was to rather lower prices this week owing to the continued absence of improvement in the volume of business. Shares of companies identified with the chemical and allied industries were relatively well maintained.

Imperial Chemical at 29s. 7½d. are virtually the same as a week ago, and Distillers, although less active, are little changed at 94s. 6d. The final dividend announcement of the last-named company is expected early next month. Associated Portland Cement gained 1s. 3d. to 76s. 3d., but British Plaster Board reacted 6d. to 26s. 9d., although the market remains hopeful that the dividend on the latter may be kept on a 50 per cent. basis. Sangers were moderately lower at 21s. 9d., despite satisfaction with the dividend announcement, which was up to best market expectations. Boots Pure Drug at 39s. 9d. improved moderately, pending the meeting. The recently-issued results of the latter company tended to draw increased attention to the particularly strong balance sheet, and it is pointed out that the various subsidiaries, which retain a proportion of their annual profits, probably also have substantial reserves. British Drug Houses were again around 22s. 6d., and Timothy Whites and Taylors transferred around 25s. The assumption is that the last-named company may before long require further capital and that in view of the statements at the meeting, this is likely to take the form of an offer of additional shares to shareholders at a price involving a bonus.

Lever and Unilever have been active at the rather higher price of 37s. Fison Packard and Prentice were again steady at 32s. 6d., and Cooper McDougall and Robertson were also unchanged at 29s. 4½d. United Glass Bottle remained at the lower level of 45s., but were relatively steady, the assumption being that as full benefits probably have not yet been derived from the businesses acquired last year, there are prospects of a further rise in profits and a larger dividend. Key Glassworks shares have been more active on the larger interim dividend, while Forster's Glass were maintained in price under the influence of the recently-issued results and the larger dividend. Triplex Safety Glass 10s. ordinary units, which have a large following and therefore tend to move very closely with the general market tendency, fluctuated moderately this week.

British Oil and Cake Mills preferred ordinary shares had a fairly steady appearance at 43s. 6d. and United Premier Oil and Cake ordinary shares were again around 7s. 3d. Barry and Staines at 38s. are within 3d. of the price ruling a week ago and Michael Nairn have gained 6d. to 57s. 6d. Wall Paper deferred at 34s. 6d. are again lower on balance, but have a steadier tendency at the time of writing, it being pointed out in the market that even if the dividend were reduced to 10 per cent., the shares at their current level would offer a favourable yield. International Combustion shares were maintained at around 92s. following the announcement of the 7½ per cent. interim dividend.

General Refractories reacted 6d. to 12s. 6d. B. Laporte were again quoted at 87s. 6d., and British Tar Products at 10s. 3d. Courtaulds were reactionary, awaiting next month's interim dividend announcement. Bleachers, Bradford Dyers and other textile shares were also moderately lower on the week.

Iron, steel and similar securities again moved slightly in favour of holders. Consett Iron were firm in view of the good earning capacity shown by the financial results, while Whitehead Iron and Steel were better following publication of the full results. Guest Keen improved and Dorman Long were slightly better. In other directions, General Electric rose strongly on the 20 per cent. distribution for the past year, which exceeded general market estimates.

Oil shares were reported to be firmer under the influence of the good impression created by the "Shell" and Anglo-Iranian annual reports and the larger distribution announced by Lobitos Oilfields.

Weekly Prices of British Chemical Products

TRADE in the general chemical market has followed a very even trend during the past week with no particular activity to record in any direction. The volume of spot inquiries has been a little below the normal for the period and so far as contract deliveries are concerned quantities going forward for consumption are smaller than for some time past. Values continue to be well held throughout the market and the general outlook is regarded as satisfactory. There have been no important price alterations for general chemicals, rubber chemicals and wood distillation products and quotations for most items are steady. The coal tar market is again without feature and in the continued absence of any substantial buying orders quotations remain on a nominal basis.

MANCHESTER.—So far as actual new business is concerned trading conditions in the Manchester chemical market during the past week have been slow, few important orders having been reported. After the suspension of deliveries against contracts in consequence of the Whitsuntide holidays the movement of the bread-and-butter lines has been resumed on a fair scale, though the consumption of textile chemicals is still far from satisfactory. Prices of most descriptions of heavy chemicals are reasonably steady. Business in the by-products, except in one or two departments, has been on quiet lines, and the declining tendency of prices has not yet been halted, easier conditions having been reported this week in cresylic acid.

Price Changes

Falls: Copper Sulphate (Manchester and Scotland); Lead Acetate, white and brown (Manchester); Cresylic Acid, pale, 99/100%.

GLASGOW.—Business in general chemicals has been rather quieter during the week, both for home trade and export. Lead and copper products are rather easier on account of the lower prices ruling for metals, but other items continue quite steady at about previous figures, with no important changes to report.

General Chemicals

ACETONE.—**£45 to £47 per ton.**

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £19 per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—**£68 per ton.**

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 3½d. per lb. d/d station in 70-lb. cylinders (1-ton lots).

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIUM OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £17 15s. per ton f.o.b. SCOTLAND: £18 per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—**£20-£22 per ton.**

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £4 2s. 6d. to £5 2s. 6d. per cwt. according to quantity; in drums, £3 15s. 0d. to £4 7s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £30; brown, £29.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2¼% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £38 10s.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 1s.

POTASSIUM PRUSSIATE.—6¼d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6¾d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts. MANCHESTER:

SODIUM CHROMATE.—4¼d. per lb. d/d U.K.

4d. per lb. GLASGOW: 4¼d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered per ton lots.

SODIUM PRUSSIATE.—d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5¼d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. to 1s. 1½d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—4s. 3d. to 4s. 6d. per lb.

CARBON BLACK.—3¼d. to 3 15/16d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10¼d. to 11d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4¾d. to 5¼d. per lb.; dark 3¾d. to 4¼d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1938.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10¼d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 7d. to 1s. 8d. per gal.; crude, 11d. to 1s. per gal.

CARBOLIC ACID.—Crystals, 7¾d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 2s. 9d. to 3s.; dehydrated, 3s. to 3s. 3d. per gal. MANCHESTER: Crystals, 7¼d. per lb. f.o.b. in drums; crude, 2s. 4d. per gal.

CREOSOTE.—Home trade, 5½d. per gal., f.o.r. makers' works; exports, 6¾d. to 6¾d. per gal., according to grade. MANCHESTER: 4½d. to 5¾d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6¼d.

CRESYLIC ACID.—97/99%, 2s. to 2s. 3d.; 99/100%, 3s. 6d. to 5s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 4d. to 2s. 7d.; Dark, 95%, 1s. 8d. to 1s. 10d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification. 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 2s. 8d.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £5 5s. to £6 5s. per ton; purified crystals, £14 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £6 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £15 per ton f.o.b.

PITCH.—Medium, soft, 33s. per ton, f.o.b. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

PYRIDINE.—90/140%, 13s. 6d. to 15s. per gal.; 90/160%, 10s. 6d. to 13s. 3d. per gal.; 90/180%, 3s. 3d. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 10s. to 11s. 6d. per gal.

TOLUOL.—90%, 1s. 10d. per gal.; pure, 2s. 2d. GLASGOW: 90%, 120, 1s. 10d. to 2s. 1d. per gal.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 5s. to £9 15s. per ton; grey, £9 5s. to £9 15s. MANCHESTER: Brown, £8 10s.; grey, £10.

METHYL ACETONE.—40.50%, £35 to £40 per ton.

WOOD CREOSOTE.—Unrefined, 4d. to 6d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—3s. 3d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.

WOOD TAR.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—8¼d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 9¼d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—10½d. per lb.; P.G., 1s. 0¼d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

o-TOLUIDINE.—11½d. per lb., in 8/10-cwt. drums, drums extra.

p-TOLUIDINE.—2s. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 8d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ACME SOAP CO., LTD., Manchester. (M., 18/6/38.) June 3, £150 debentures, part of a series already registered.

BARRONIA METALS, LTD., London, W. (M., 18/6/38.) May 31, agreement, to New Trading Co., Ltd., securing £30,000 (not ex.); floating charge on book debts, etc. *Nil. April 8, 1938.

ELTON COP DYEING CO., LTD., Bury. (M., 18/6/38.) May 31, £2,500 debentures, part of a series already registered. *£1,450. December 29, 1937.

Declarations of Solvency Filed

DYOLA, LTD., London, W. (D.S.F., 18/6/38.) Manufacturers of dyes and dyestuffs. June 1.

GEORGE SKEY AND CO., LTD. (formerly Wilnecote Co., Ltd.). (D.S.F., 18/6/38.) Stoneware manufacturers, etc. June 1.

New Companies Registered

Adams and Davis, Ltd. 340,464.—Private company. Capital £750 in 750 shares of £1 each. To carry on the business of consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: Arthur Adams, 11 Hepscott Terrace, Westoe, South Shields; Fredk. R. Davis.

John Stanley, Ltd. 340,837.—Private company. Capital £20,000 in 20,000 shares of £1 each. To carry on the business of consulting, analytical, manufacturing, pharmaceutical and general chemists, herbalists and seedsmen, etc. Subscribers: Stanley John Chubb, 69 Leadenhall Street, E.C.3; Leonald F. Gould.

A. Learner and Co., Ltd. 340,427.—Private company. Capital £5,000 in 4,900 preference shares of £1 and 1,000 ordinary shares of 2s. each. To acquire the business of a manufacturer of cellulose lacquers, paints, synthetic paints, paint thinners, paint cleaners and removers, rubber solutions of all kinds and weed killer now carried on by Abraham Learner, trading as "A Learner and Co.," at Wharton Street, Nechells, Birmingham, and Bays Nos. 1 and 2, 15a Colindale Avenue, Hendon, together with the trade mark "Cellothin." Directors: Abraham Learner, "Ponteland," Elmdon Lane, Marston Green, Warwickshire; Barnet M. Letsky. Registered office: Wharton Street, Nechells, Birmingham.

Aluminium Laboratories, Ltd. F3,504.—Capital 500,000 dollars in 5,000 shares of 100 dollars each. Registered in Canada as a private company. To carry on the business of chemical, mining, civil, mechanical, electrical, sanitary and consulting engineers; to establish and maintain laboratories, etc. The British address is at Southam Road, Banbury, Oxon.; Henry C. Thomas, of 81 Summerlee Avenue, East Finchley, N.2, is authorised to accept service of process and notices on behalf of the company. Directors: Earl Blough, Fogland Road, Tiverton, Rhode Island, U.S.A.; Lawson G. Bash, Mario Bello, Walter C. Binz, Manoel J. B. de S. Pernes, Ludwig Braasch, Edmund C. Harder, Andre Henry Couannier, Sigurd Klouman, Elmer G. MacDowell, Edwin J. Mejia, Fredk. S. Mitman, Ray E. Powell, Harold H. Richardson, Paul S. White.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Mexico.—A well-established agent at Mexico City wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of linseed oil, and special oil for tanners, for Mexico. (Ref. No. 426.)

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the South African Railways and Harbour Administration is calling for tenders, to be presented in Johannesburg by July 11, 1938, for the supply of raw and boiled linseed oil. (Ref. T.Y. 22938/38.)

Company News

The "Sanitas" Trust is maintaining its dividend for the year ended May 31 at 8½ per cent., tax free. In addition, the company has decided to distribute a 100 per cent. scrip bonus in the form of one new ordinary share for each old share held.

I. G. Farbenindustrie (German Dye Trust) in their full report for 1937 show net income Rm.173,048,000 (Rm.146,311,000); less debenture interest; depreciation, Rm.105,250,000 (Rm.81,132,000); reserve, Rm.15,294,000 (nil); directors' bonus, Rm.453,000 (Rm.680,000); dividend, 8 per cent. (7 per cent.); forward, nil (Rm.12,094,000). Turnover showed satisfactory increase.

Lautaro Nitrate Co. announce interim payments of 1½ per cent., actual, less tax, each on account of interest on the outstanding £817,208 first mortgage income debenture stock, and £833,912 first mortgage (Antofagasta) income debenture stock. Both payments, which are the same as at this time last year, will be made on June 30.

Liebig's Extract of Meat Co. have declared an interim dividend of 4 per cent., free of tax, on the £2,000,000 £5 ordinary share capital. A similar interim was paid last year, followed by a final of 7 per cent., making a total payment of 11 per cent., tax free. The dividend now declared will become payable on and after July 8 to holders of ordinary shares registered on the books on June 9.

Apex (Trinidad) Oilfields is maintaining its interim dividend at 12½ per cent., less tax, on the £550,000 ordinary capital. For 1936-37 a final payment of 32½ per cent. brought the total for the year to 45 per cent. The present dividend is payable July 16 to holders registered June 20. Tax will be deducted at 2s. 10.72d. in the £.

Eaglescliffe Chemical Co., in their statutory report shows receipts and payments from March 14, 1938, to May 30; receipts in respect of shares subscribed for in cash; 6 per cent. cumulative preference shares, £75,000; ordinary shares, £20; other receipts, including cash in hand taken over from vendor company, etc., £30,188; balance due to company's bankers at May 30, less cash in hand, £13,976. Payments: redemption of £75,000 unsecured loan stock, £75,000; interest paid to vendor company on purchase consideration, from January 1 to date of incorporation, £1,125; other payments for purchases, etc., £30,756; balance due to company's bankers at date of incorporation, March 14, £12,302.

Anglo Continental Guano Works, Ltd., which is controlled by Fison, Packard and Prentice, Ltd., proposes to reduce the dividend on the preference shares from 7½ per cent. to 4½ per cent. as from July 1. The controlling company owns 313,361 of the 375,000 issued preference shares. The rights of preference shareholders to vote at general meetings are to be abolished. It is proposed to create 125,000 additional 4½ per cent. £1 preference shares ranging pari passu with the existing preference. To compensate the minority preference shareholders for agreeing to the modifications of their rights Fison, Packard and Prentice, Ltd., will give them two fully-paid preference for every five preference shares held. Fison, Packard and Prentice, Ltd., will also guarantee the payment of the 4½ per cent. preference dividend and the repayment of preference capital in a winding-up.

Griffiths Hughes Proprietaries, which owns the whole of the issued capital of E. Griffiths Hughes, proprietors of Kruschen Salts, etc., in their accounts for the nine months to end of March last, show a net profit for the period of £110,336. The corresponding figure for the previous year was £166,449. Although the end of the financial year has been changed, the accounts again include dividends from the operating company in respect of a full year, which amounted to £113,751—a fall of £56,875. Total income was £114,112, against £171,259 for the previous twelve months. As already announced, the distribution for the period is 6½ per cent., less tax. For the year ended June 30, 1937, 11 per cent. was paid, compared with 17½ per cent., including a 2½ per cent. bonus, for 1935-36. The carry-forward, after crediting £1,021 tax recovered, is reduced from £8,065 to £7,234.

Zinc Corporation in their 1937 accounts, show profit on mine trading account of £578,242, compared with £354,911 in 1936. This year's figure is struck after providing £16,000 for employees' fund and £25,000 for hospital and social services. Interest and sundry receipts are £10,503 higher at £89,026. Tax absorbs £101,316, against £54,409, and in addition £25,000 is set aside for N.D.C. After appropriating £95,000, compared with £50,000, for shaft sinking and special development, net profits for the year are up from £319,436, to £432,909. As already announced, a final dividend of 45 per cent. is being paid on the ordinary shares, bringing the total for the year to 85 per cent., compared with 60 per cent. in the previous year. A final participating dividend of 22½ per cent. has also been announced on the 20 per cent. preference shares, making the total participating dividend 42½ per cent., against 30 per cent. These payments leave the carry-forward £1,767 higher at £57,124.